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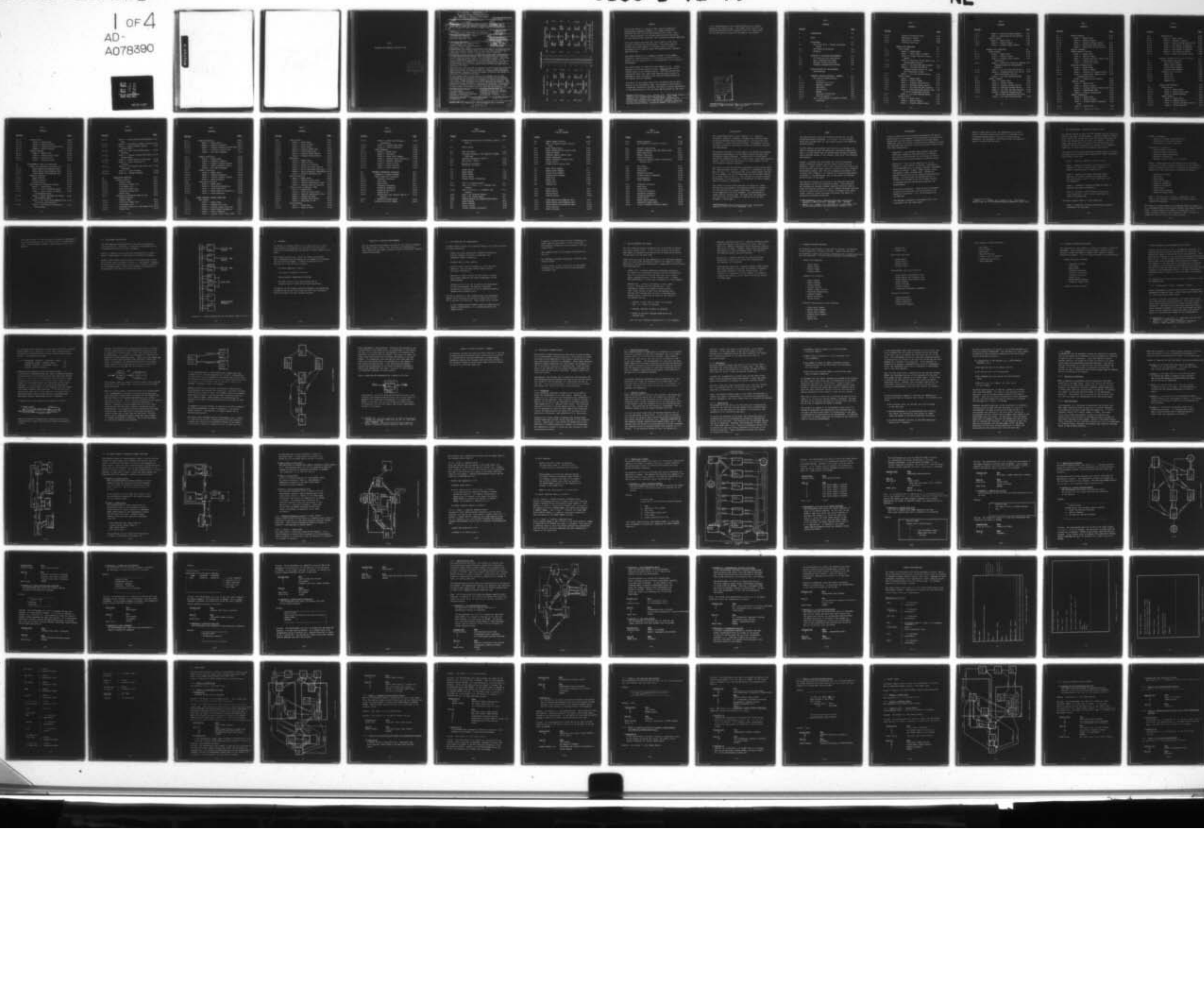

PART I

SOFTWARE REQUIREMENTS SPECIFICATION

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16. Abstract This report defines the detailed operational requirements for the Vessel Traffic System (VTS) Processing/Display Subsystem and provides the current state of the software design. Both parts (i.e., requirements and design) of this report begin with an overview and an introduction to the methodology used. The balance of both parts is a detailed, technically oriented, function by function description of the specification on the one hand and the design on the other.

Specifications are included for operator invoked functions which are used to enter and retrieve information, and to request subsystem services, as well as specifications for automatic processes which update vessel location, course and speed, and detect and report on potentially hazardous conditions.

At the highest level of the design, the software for the VTS Processing/Display Subsystem has been decomposed into processes which operate concurrently and cooperate to perform the required functions. These processes will communicate and synchronize their activities by the exchange of explicit messages and answers. This approach provides flexibility in assigning processes to processors, which is a critical factor in providing a system that can manage a broad range of functional and load handling requirements.

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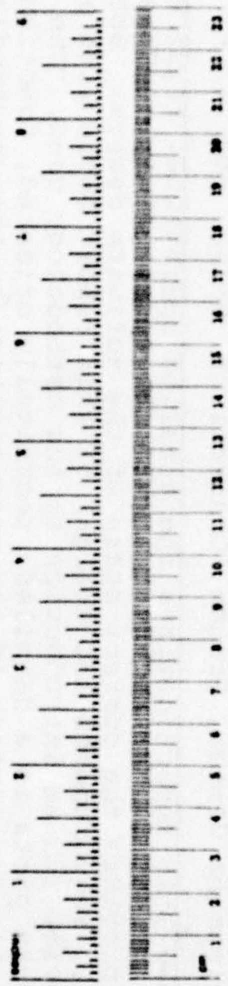
METRIC CONVERSION FACTORS

Approximate Conversions to Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
		LENGTH		
in	inches	*2.5	centimeters	cm
ft	feet	30	centimeters	cm
yd	yards	0.9	meters	m
mi	miles	1.6	kilometers	km
		AREA		
in^2	square inches	6.5	square centimeters	cm^2
ft^2	square feet	0.09	square meters	m^2
yd^2	square yards	0.8	square meters	m^2
mi^2	square miles	2.6	square kilometers	km^2
	acres	0.4	hectares	ha
		MASS (weight)		
oz	ounces	28	grams	g
lb	pounds	0.45	kilograms	kg
	short tons (2000 lb)	0.9	tonnes	t
		VOLUME		
tsp	teaspoons	5	milliliters	ml
Tbsp	tablespoons	15	milliliters	ml
fl oz	fluid ounces	30	milliliters	ml
c	cups	0.24	liters	l
pt	pints	0.47	liters	l
qt	quarts	0.95	liters	l
gal	gallons	3.8	liters	l
ft^3	cubic feet	0.03	cubic meters	m^3
yd^3	cubic yards	0.76	cubic meters	m^3
		TEMPERATURE (exact)		
°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C

*1 in ≡ 2.54 (exactly). For other exact conversions and more detailed tables, see NBS Misc. Publ. 286, Units of Weights and Measures, Price $2.25, SD Catalog No. C13.10:286.



Approximate Conversions from Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
		LENGTH		
mm	millimeters	0.04	inches	in
cm	centimeters	0.4	inches	in
m	meters	3.3	feet	ft
m	meters	1.1	yards	yd
km	kilometers	0.6	miles	mi
		AREA		
cm^2	square centimeters	0.16	square inches	in^2
m^2	square meters	1.2	square yards	yd^2
km^2	square kilometers	0.4	square miles	mi^2
ha	hectares (10,000 m^2)	2.5	acres	
		MASS (weight)		
g	grams	0.035	ounces	oz
kg	kilograms	2.2	pounds	lb
t	tonnes (1000 kg)	1.1	short tons	
		VOLUME		
ml	milliliters	0.03	fluid ounces	fl oz
l	liters	2.1	pints	pt
l	liters	1.06	quarts	qt
l	liters	0.26	gallons	gal
m^3	cubic meters	35	cubic feet	ft^3
m^3	cubic meters	1.3	cubic yards	yd^3
		TEMPERATURE (exact)		
°C	Celsius temperature	9/5 (then add 32)	Fahrenheit temperature	°F

PREFACE

This is the third in a series of four reports prepared by International Computing Company (ICC) under Contract No. DOT-CG-81-78-1833, for the United States Coast Guard. This third report presents the software specifications and design for the Vessel Traffic Services (VTS) Processing/Display Subsystem.

The first report* described the initial design study which focused on alternative architectures. The second report** carried the initial design to a greater level of detail, discussed critical design issues and presented basic hardware specifications.

The fourth report*** is a companion volume to this report, providing a detailed design of an operating system which can support the VTS application in a multicomputer, high reliability environment.

This third report is essentially two reports in one. Part I presents the software specifications. Part II presents the current state of the software design. Both portions provide significant detail but leave open questions which cannot be answered at this time such as the precise characteristics of the display station hardware.

Both parts of this report begin with an overview and an introduction to the methodology used. The balance of both parts is a detailed, technically oriented, function by function description of the specification on the one hand and the design on the other.

*Henson, C.C., Cleaver, R.A., Kaisler, S.H., "Preliminary Design Study for VTS Processing/Display Subsystem," June, 1978. AD61300

**Henson, C.C., Mickey, F.T. , Graham, R.S., McIntosh, B.A., "VTS Processing/Display Subsystem Design," January, 1979.-A074 053

***Cohn, D.A., Mickey, F.T., "VTS Processing/Display Subsystem Detailed Software Design - Operating System," July 1979. A076 501

A full understanding of the detailed material will require extensive and careful study. The reader should refer to the functional description**** prepared by the U.S. Coast Guard for the definition of terms not provided in this report.

****VTS Processing/Display Subsystem Functional Description, Appendix 8, RFP 81-77-1833, September 1977.

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1 INTRODUCTION

Good requirements must be multi-faceted (i.e., complete, consistent, feasible, testable, traceable and flexible enough to allow trade-offs during system design), yet they must also be stated in a clear and concise manner. Consequently, one of the major problems in developing a system is precisely defining the requirements.

The objective of Part I of this report is to define the detailed operational requirements for the Vessel Traffic Services (VTS) Processing/Display Subsystem. Elaborating on the functional description prepared by the U.S. Coast Guard[1], these specifications extend, clarify and make operational the requirements for the VTS Processing/Display Subsystem.

Our intent is that this software requirements specification serve as a user-developer contract. Therefore, it represents the user's point of view (i.e., describing what is to happen rather than how it is to happen), but is precise enough that the software design can proceed directly from it. The information included, updated as necessary, can also provide the foundation for user's manuals when the system is implemented.

The concept of finite state machines (see Section 5, State Machines for Requirements) was extremely helpful in developing the detailed VTS software requirements. On the basis of our experience, we would recommend this methodology to others facing a similar task. We trust that the techniques will also prove to be helpful to those who will use this document in the future.

[1] VTS Processing/Display Subsystem Functional Description, Appendix 8, RFP 81-77-1833, September, 1977.

2 SCOPE

This specification covers the software required for the VTS Processing/Display Subsystem. It is Part I of this document which also includes Part II, the current state of the subsystem software design.

The VTS software requirements specification is intended to be used in conjunction with the functional description prepared by the U. S. Coast Guard[1] and the system design document[2] prepared during previous phases of the contract under which this document was prepared.

Chapter 3 discusses the environment for the VTS Processing/Display Subsystem software and the system architecture and hardware. Vessel Traffic Center (VTC) functions and organization, major subsystem data bases, operator invoked functions, automatic background processes, and off-line processing requirements are outlined within Chapter 4, an Overview of Subsystem Requirements. In Chapter 5, the methodology used in developing the software specifications is discussed.

The remaining chapters are devoted to the detailed functional requirements for the VTS subsystem software. Specifications are included for operator invoked functions which are used to enter and retrieve information, and to request subsystem services; as well as specifications for automatic processes which update vessel location, course and speed, and detect and report on potentially hazardous conditions.

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1 VTS Processing/Display Subsystem Functional Description, Appendix 8, RFP 81-77-8133, September, 1977. Revised.

2 Henson, C.C., Graham, R.S., McIntosh, B.A., and Mickey, F.T., VTS Processing/Display Subsystem Design, January, 1979.

3 ENVIRONMENT

A major objective of this software requirements and design specification is to produce a VTS Processing and Display Subsystem that can serve ports throughout the United States. Therefore, given the variety of physical environments in which the subsystem must function, the following major design goals have been established:

. Flexibility - the hardware and software must have sufficient capability and flexibility to support the varying functions and the wide range of system loads which will be encountered at different ports.

. Modularity - which allows adaptability of the system to a wide variety of harbors, expandability (and contractability) to handle increased (decreased) numbers of vessels, higher (lower) sensor levels, and greater (less) coverage area. Modularity improves maintainability by making trouble-shooting easier. It also allows the standardization of hardware and software which facilitates training of hardware/software maintenance personnel and watchstanders.

. Distributed Processing - using multiple processors to share the processing load and provide a high degree of reliability (i.e., 99.9% availability is required).

. Off-the-shelf hardware to the extent that it is consistent with the other goals.

Based on these design goals, the subsystem will be built around a flexible system architecture, as proposed in the preliminary design study,[1] that will allow the system hardware to be expanded or contracted to meet the specific needs of a particular VTS site.

[1] Henson, C.C., Cleaver, R.A., Kaisler, S.H., "Preliminary Design Study for VTS Processing/Display Subsystem," June, 1978.

3.1 VTS SYSTEM MODES, CLASSES AND SENSOR LEVELS

The various harbors in which the VTS systems could be installed offer a wide range of requirements. Both the number of vessels which traverse the harbor daily and the waterway geography may affect the complexity of the harbor environment. The mode, class, and sensor level of a particular VTS subsystem will determine the harbor parameters and, therefore, the system's capability of meeting the environmental requirements.

Five levels of VTS systems have been defined based on the type of sensor which provides vessel position and course information. These sensor levels are:

- Level 1 - Location reports by voice on radio;
- Level 2 - Manual or automatic point sensors (e.g., magnetic or acoustic sensors which indicate a vessel's passage without identifying it);
- Level 3 - Manual area sensors which may detect position and course information automatically, but require manual entry of this information into the subsystem;
- Level 4 - Automatic tracking by radar and input of position and course information;
- Level 5 - Automatic tracking using active shipboard electronics, such as radar transponders or Loran-C retransmitters.

The three possible modes of a VTS system are:

- Mode A - Informing, for which the following types of information are provided;

- Traffic information
    . Identity of nearby vessels and buoys
    . Predictions of future encounters
    . Prediction of traffic congestion

- Navigational information
    . Unusual weather conditions
    . Tide and current conditions
    . Status of aids-to-navigation
    . Hazards of navigation
    . Maritime events of particular concern

. Mode B - Hazard detection and reporting which provides, in addition to Mode A services, detection of the following types of hazards (which may be accomplished automatically, depending on the availability of appropriate sensors);

- Potential Collision
- Lane Stray
- Route Stray
- Potential Grounding
- Excessive Congestion
- Dangerous Encounters
- Anchor Drift
- Navaid Adrift/Missing
- Excessive Vessel Speed

. Mode C - Routing which provides, in addition to the Mode A and B services, congestion free vessel routing through the waterway.

The class of a system refers to its maximum operating capability. It is designated using letters which specify the highest operating modes. Class B systems may operate in either Mode A or B. Class B systems, however, cannot operate in Mode C because the capability would not exist in a Class B system.

Most combinations of Class and Level are possible, depending on the harbor parameters and the relative need for hazard detection. Class A systems, however, cannot support Level 4 or 5 sensors.

3.2 VTS SYSTEM ARCHITECTURE

The VTS Subsystem architecture will use large minicomputers interconnected by a shared bus. Logically, the system will be a distributed function, multiple processor.

Figure 3-1 depicts this architecture configured for a Class C, Level 4 system capable of monitoring 900 identified vessels.

Several other system architectures were evaluated based on the major design goals discussed in Section 3, Environment. However, we selected this architecture because it is the most in keeping with our design goals, allowing the hardware configuration to be adjusted to the needs of a particular port.

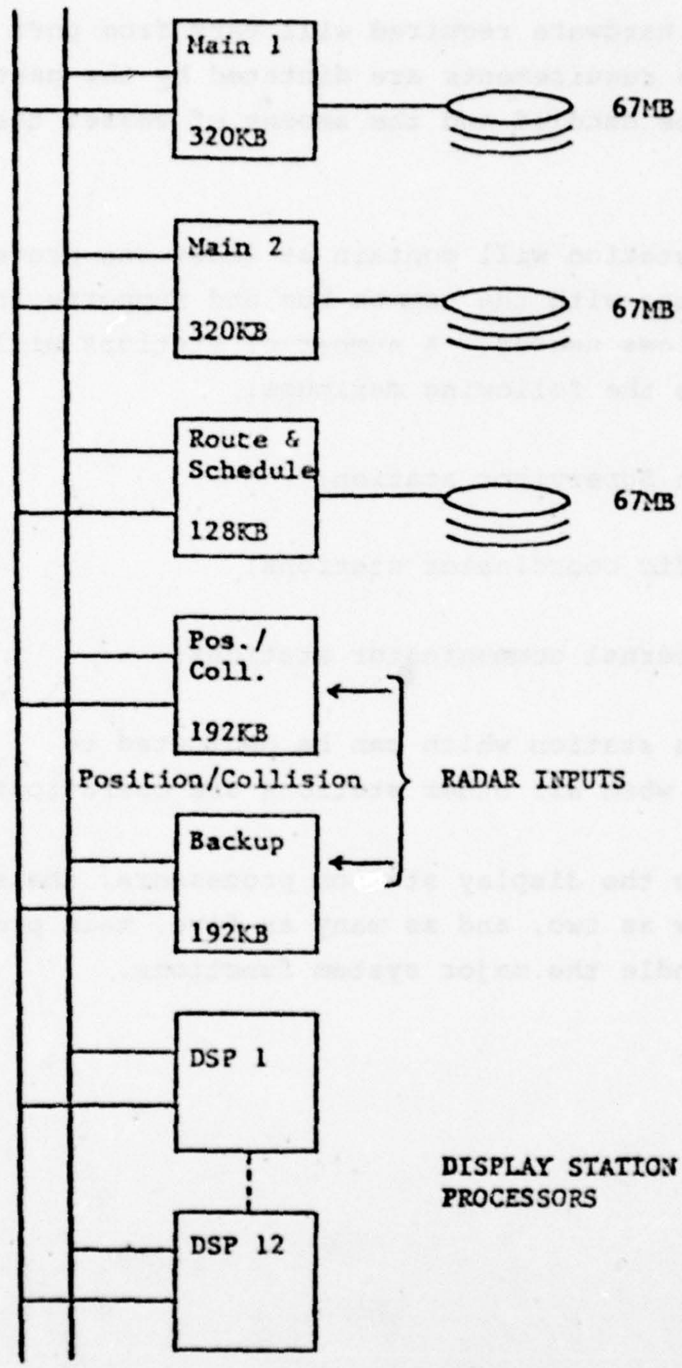


Figure 3-1. System Architecture for 900 Ships, Class C, Level 4

3.3 HARDWARE

The amount of hardware required will vary from port to port since hardware requirements are dictated by the particular functions to be handled and the amount of vessel traffic anticipated.

Each display station will contain at least one processor which interfaces with the common bus and supports the graphics and other devices needed. A number of stations will be required up to the following maximums:

- One Watch Supervisor station;
- Ten traffic coordinator stations;
- Three external communicator stations;
- One spare station which can be dedicated to training when all other stations are operational.

In addition to the display station processors, the system may include as few as two, and as many as five, main processors which will handle the major system functions.

4 OVERVIEW OF SUBSYSTEM REQUIREMENTS

The VTS Subsystem requirements included in this chapter encompass the Vessel Traffic Center (VTC) functions and organization, major subsystem data bases, operator invoked functions and automatic background processes.

4.1 VTC FUNCTIONS AND ORGANIZATION

A Vessel Traffic Center (VTC) performs some, or all, of the following five major functions:

- Detect and report potentially hazardous situations, such as imminent collisions, groundings, and excessive traffic congestion;
- Schedule and/or route traffic;
- Provide safety related information to the maritime community, such as other vessel traffic routes and buoys off-station;
- Maintain a traffic history for the harbor to assist with traffic research and enable measurement of VTS effectiveness;
- Maintain a log of all VTC activities for measurement of VTS effectiveness, and provide a detailed accounting of activities of the VTC and participating vessels when accidents occur.

The VTS is basically a data communications and processing network which provides the requisite capabilites for the VTC to perform its functions. These capabilities include:

- A voice communications network enabling communications between watchstanders (i.e., system operators) and vessel pilots;

- A network of sensors used to obtain information on vessel position and course, as well as waterway environmental parameters such as weather, tide and current data;

- Data communications links between the sensors and the VTC;

- An information storage, processing, retrieval, and display system;

- A set of vessel traffic monitoring and management procedures for real-time analysis and management of traffic flow.

4.2 MAJOR SUBSYSTEM DATA BASES

The VTS Processing/Display Subsystem will be required to support five major logical files. It will be the function of the software design to determine the precise form of these files and the storage media for the data items.

These files will vary in size depending on the individual requirements of a particular VTS System; however, the number of records required for the maximum configuration is specified in the following brief descriptions.

- Vessel File - contains background information pertaining to vessels which frequently traverse the VTS coverage area. This file eliminates collecting data each time a vessel makes a passage through the VTS coverage area. In maximum configuration, it will have a capacity of 10,000 vessels.

- Passage File - contains information on each vessel while it traverses the VTS coverage area. This information includes the vessel's identification code, cargo, points of entry into and expected exit from the VTS coverage area, as well as intended route. Passage status, reflecting the state of the vessel in its passage, may be:

  - imminent (vessel about to enter the coverage area, i.e., begin its passage)

  - underway (passage currently in progress)

  - docked or anchored (passage ended within the coverage area)

  The file has a maximum configuration of 2,000 passages.

. Waterway Characteristics File - contains information about normal and special routes through the harbor, map cell data (e.g., depths), waypoints (which facilitate position reporting in a Level 1 system), docks, piers and Navaids. Its capacity is 160,000 waterway cells, 400 waypoints, 600 docks and piers, and 2,000 Navaids.

. Notice File - contains the text of official notices pertaining to some or all of the VTS coverage area. Its capacity is 100 notices.

. Environmental Data File - contains weather, water current and tide information collected from manual or automatic environment sensors in the VTS coverage area. Its capacity is 20 automatic weather sensors, 20 automatic current/tide sensors, and 40 inputs from manual sensors of either type.

4.3 OPERATOR INVOKED FUNCTIONS

The subsystem must support a wide range of operator (watchstander or Watch Supervisor) invoked functions. These functions allow the operator to enter and retrieve information and to request services from the subsystem. A list of these functions is provided below.

- Vessel File Functions
  - Enter Vessel
  - Modify Vessel
  - Delete Vessel
  - Display Vessel
- Passage File Functions
  - Enter Passage
  - Modify Passage
  - Delete Passage
  - Display Passage
  - Update Vessel Position
  - Enter New Communication
  - Identify Vessel
  - Modify Checkpoint
  - Change Status
- Waterway Characteristics File Functions
  - Enter Route Segment
  - Modify Route Segment
  - Delete Route Segment
  - Display Route Segment
  - Enter Cell
  - Modify Cell

- Delete Cell
- Display Cell

. Notice File Functions

- Enter Notice
- Modify Notice
- Delete Notice
- Display Notice

. Environmental Data File Functions

- Enter Manual Environmental Data
- Modify Manual Environmental Data
- Delete Manual Environmental Data
- Enter Forecast
- Modify Forecast
- Delete Forecast
- Display Environmental Information

. Simulation Functions

- Enter Simulation
- Modify Simulation
- Delete Simulation
- Simulation Playback

. Other Operator Invoked Functions

- Key Search
- Local Traffic
- Encounters
- Relative Position
- Closest Point of Approach
- Scheduling and Routing
- Alert Responses

4.4 AUTOMATIC BACKGROUND PROCESSES

The subsystem will also support a variety of automatic background processes. These processes include automatic updates to the location, course and speed of vessels and a number of hazard detection processes. A list of these processes is provided below.

- Hazard Detection Processes
  - Potential Collision
  - Lane Stray
  - Route Stray
  - Potential Grounding
  - Excessive Congestion
  - Dangerous Encounters
  - Anchor Drift
  - Navaid Adrift/Missing
  - Excessive Vessel Speed

- Automatic Position Update

5 STATE MACHINES FOR REQUIREMENTS SPECIFICATION

From the user's point of view, a recommended formalism[1] for representing the functional requirements of a system in an operational manner is the use of finite state machines. This approach was selected for the detailed requirements specifications which follow. It has a sound theoretical foundation in mathematics and has been used to represent other systems and formats. For example, it has been used in the description of scanners for compilers, as the basis for requirements specification, as well as in the top level design in the New York Times project[2]. In spite of its theoretical rigor, it is easy to write and understand since it permits an intuitive graphic representation.

The formalism for a finite state machine is composed of a set of ordered pairs:

M = ((currentstate, input), (newstate, output))

where M represents the machine and the set of ordered pairs represents a function from a current state and an input value to a new state and an output value.

In terms of software requirements, the states denote major data configurations during processing. The initial state or start state consists of the data created for the initial invocation. The function or transition rules from state to state represent programs or functions that change the basic states of data, based on a particular input, and possibly result in a printed output based on this transformation.

---

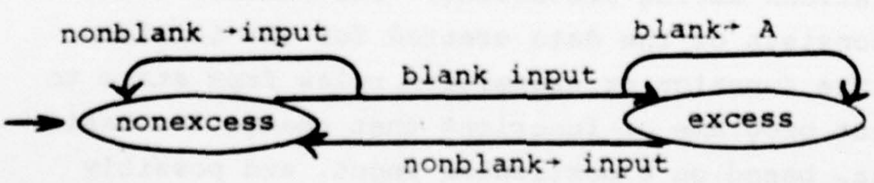
1. Farrention, A. and Mills, H., "State Machines and Their Semantics in Software Engineering."
2. Basili, V.R. and T. Baker, Structured Programming Tutorial, IEEE Catalog No. 75CH1049-6, 1975.

To illustrate this formalism, a finite state machine to eliminate excess blanks from a sequence of input text is defined below. Two states are required which have been termed excess and non-excess. M is defined as follows:

M = ((nonexcess, nonblank), (nonexcess, input), (1)
(nonexcess, blank), (excess, input) (2)
(excess, nonblank), (nonexcess, input) (3)
(excess, blank), (excess, λ)) (4)

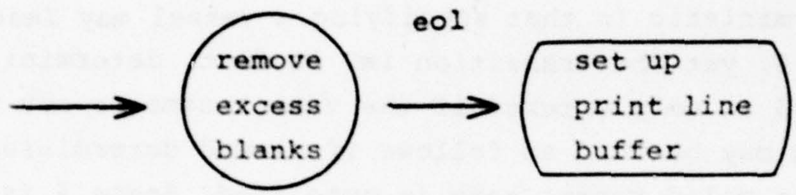
There are four possible actions that may be taken: (1) if you are in a nonexcess state and input a nonblank character, you should stay in the nonexcess state and output the current input; (2) if you are in a nonexcess state and input a blank character, you should go to the excess state (since all new blanks will be excess blanks) and output the current input character; (3) if you are in an excess state and input a nonblank, you should return to the nonexcess state and output the current nonblank input character; (4) if you are in an excess state and input a blank character, you should stay in the excess state (since the new blank is an excess blank) and output nothing (represented by the λ character).

In graphic form, this example may be shown as follows:



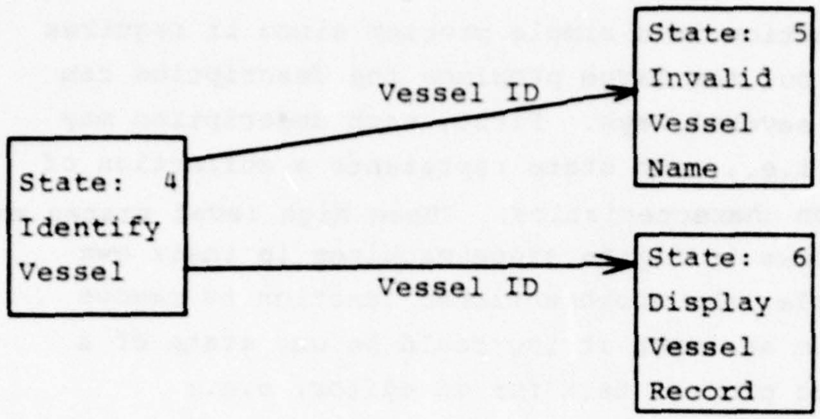
where the nodes are represented as states and the arcs as transitions with labels indicating the inputs and possible outputs.

Granted, this function is a simple problem since it requires only two states, but for large problems the description can be simplified in several ways. First, each description may be hierarchical, i.e., each state represents a collection of states with common characteristics. These high level states may again be broken down to finite state machines in their own right. For example, the aforementioned function to remove excess blanks from an input string could be one state of a larger function to process text for an editor, e.g.:



where excess blanks are removed from the current input line and at an end of line signal (EOL), the set up print line buffer state is entered.

The finite state machine was defined above to be deterministic. i.e., it represents a function in that for every state and input there was a unique state and output for the transitions. This was shown in the graphic representation as a unique function on each arc. This is the best approach for the requirements specification, but it is sometimes cumbersome to display. Therefore, a second simplification of the finite state machine has been used to define the machine as non-deterministic, i.e., multiple arcs are labeled with the same function name. This means that a particular function or transition may lead to more than one new state. Actually, this is just a shorthand notation since the state entered is uniquely determined in practice. The following example is a partially defined state machine:



It is nondeterministic in that specifying a vessel may lead to State 5 or 6, yet the transition is, in fact, deterministic in that State 5 is only entered if the vessel name is not valid. The transition may be read as follows if viewed deterministically: if in State 4 a valid vessel name is specified, State 6 is entered. Otherwise, State 5 is entered.

Another simplification has been used whereby several finite state machines are defined, each describing a different function from the user's point of view. For example, there is a separate description for each of the watchstander's possible functions (e.g., MODIFY VESSEL, DELETE VESSEL); each describing the actions to be taken by the watchstander and the effect of that action.

An example of a state diagram, as applied to the VTS Processing and Display Subsystem, is shown in Figure 5-1, the Delete Vessel function (see Section 7.3, Delete Vessel, for a detailed description).

The finite state diagrams used for requirements (e.g., Figure 5-1) can also be an aid in organizing the top level design of a system and tracing the requirements through to the design. In this case, a module is viewed as a unit of data and logic

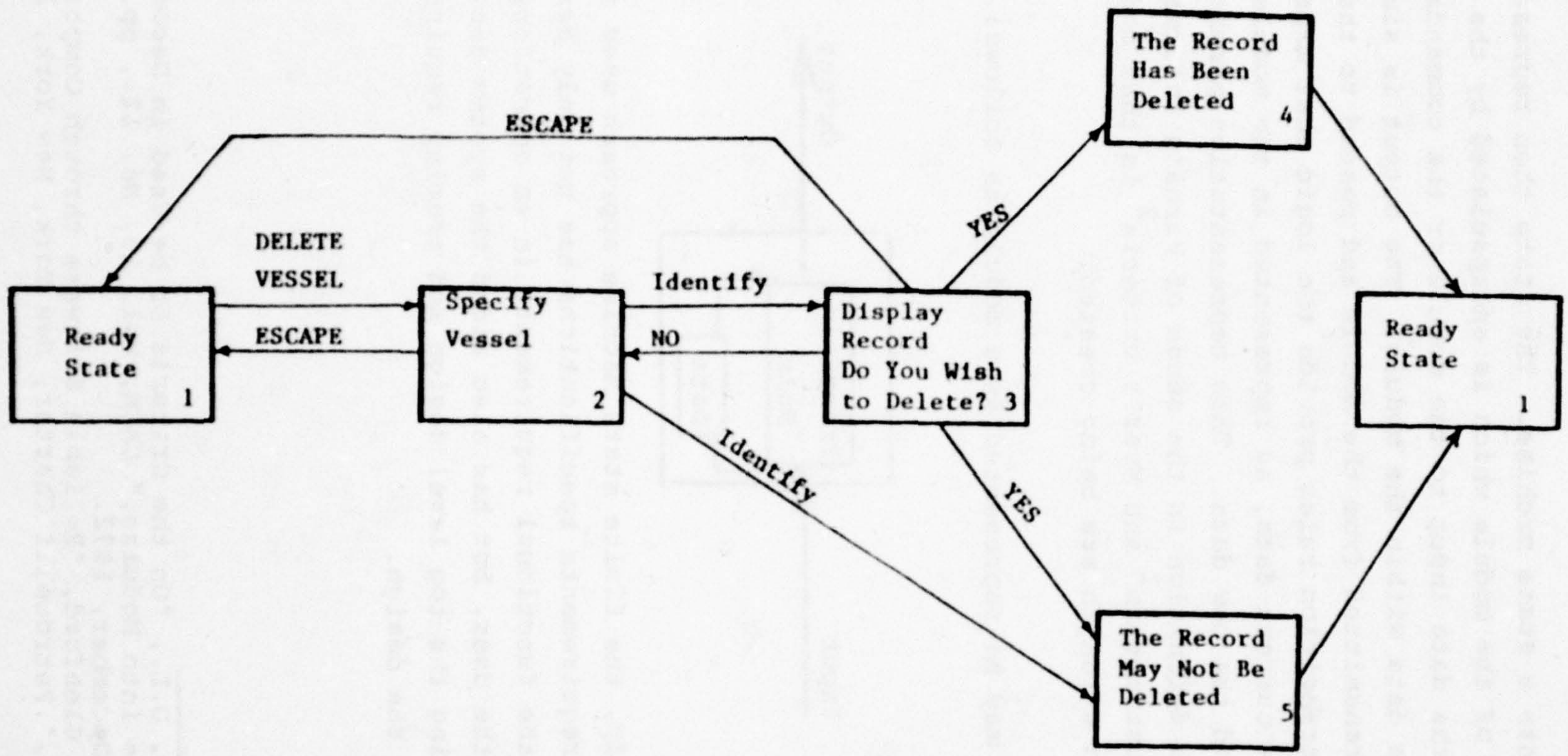
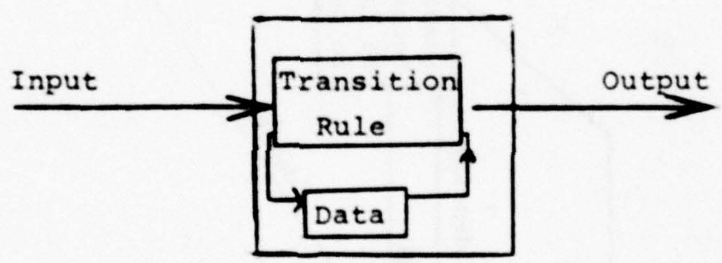


Figure 5-1. Delete Vessel

which implements a state machine. The state then represents the retained data of the module which is encapsulated by the module. The input is the data input to the module or the commands that manipulate the data within the module. The output is simply the output data transmitted from the module and passed to the next module. The transition rules provide the logic that maps the inputs and the current data, as represented in the module, to the outputs and the new data. This representation permits concise module definition in the sense of Parna's information hiding data abstraction[1] and Myer's criteria[2] in that modules of information strength are being created.

Thus, a state may be represented as a module as follows:



Consequently, the finite state machine approach used in the following requirements specifications has not only served to represent the functional requirements in an operational manner to the user, but has also aided the system designer in organizing the top level design and tracing requirements through to the design.

1. Parnas, D.L., "On the Criteria to be Used in Decomposing Systems into Modules," CACM, Vol. 15, No. 12., pp. 1053-1058, December, 1972.
2. Myers, Glenford, "Reliable Software through Composite Design," Petrocelli Charter, New York, New York, 1975.

6 OPERATOR INVOKED FUNCTIONS - GENERAL

The operator invoked functions are those functions in the VTS Processing/Display Subsystem which require manual initiation or intervention by the Watch Supervisor or watchstander. Simulation creation and playback have also been included in the operator invoked functions since these functions require initiation by the Watch Supervisor.

6.1 MAN MACHINE COMMUNICATIONS

The operator invoked functions are the result of actions taken by the watchstander or Watch Supervisor. The majority of these functions are not demanding of the system's resources nor are they particularly difficult to implement. Since these functions depend on human interaction with the system, the frequency of use of the manual functions is naturally low. From the viewpoint of the computers and the system resources expended, the manual functions are nearly irrelevant. However, these functions are crucial.

Consequently, the primary goal in specifying and designing the VTS Processing/Display Subsystem has been to provide the facilities needed by the watchstander in a convenient and easy to use form. Since the watchstander is the center of the overall VTS system, the system must serve the watchstander.

6.1.1 Prompting

In all practical instances, prompting will be provided to alert the watchstander to his next action. Normally, the prompt will be a very brief cue designating the information or operator action required. When a choice of several actions exists, all options will be displayed for operator selection (see subsection 6.1.2, Choosing from a List). For functions requiring the entry of larger amounts of data, a blank form will be displayed on which the data items to be entered are listed, followed by sufficient space for the entry of the appropriate information (see subsection 6.1.4, Data Entry).

Prompting will never hinder an operator who already knows through experience the next action required or list selection desired. Specifically, even though the system has not yet displayed or finished displaying a prompt, the watchstander may immediately proceed to invoke the next function or take the appropriate action.

6.1.2 Choosing From a List

The preferred method of communicating information to the system will be by choosing an item from a displayed list or by simply pressing YES or NO on the function keyboard. When choosing from a list, each item in the list will be preceded by a one or two digit number. The watchstander will type the list entry number desired on the numeric keyboard to indicate his selection. Some Traffic Coordinator and Watch Supervisor stations may also have the capability to select an item from a displayed list by using a trackball cursor positioning device if the station is equipped with the necessary hardware.

To minimize confusion and promote operator memorization, list selections will always be presented in the same order with the same numeric prefixes each time the list is displayed. As a result, the speed and accuracy of operator actions may be improved with experience.

6.1.3 Operator Feedback

After every decision or action by the operator, the system will indicate within one second that the command was received. If after three seconds the system has not yet complied with the requested action, enough information will be displayed to prove to the operator that the requested action was interpreted correctly. This proof may be the display of a statement, such as SEARCHING VESSEL FILE FOR VESSELS BEGINNING WITH ABC.

If an action takes longer than the maximum response time, it will be considered a system fault. In this case, the system will notify the operator that a delay has occurred and specify the current status of the action (e.g., AWAITING SCHEDULING BY THE OPERATING SYSTEM, AWAITING DISC MEMORY ACCESS, etc.). The operator may then decide to continue waiting or he may terminate the requested action by pressing ESCAPE (see subsection 6.1.6, Escape). If the operator chooses to wait, the system will

continue to update the status, as appropriate, at ten second intervals. In any case where it may not be evident to the operator that a requested action has been completed, the system will inform the operator of the completed action with a displayed message.

6.1.4 Data Entry

The basic method of manual data entry will be a fill-in data form which may occupy more than one display page. The name of each data item to be entered will be listed, followed by sufficient space in which to type the desired information.

A cursor will automatically be positioned at each entry to be made, or may be manually positioned forward to skip over information not available or backward to correct previous entries.

Whenever a data entry must be selected from a list, all choices will be displayed and the item desired will be selected as described in subsection 6.1.2, Choosing From a List.

Note: The display formats shown in this report are provided to enhance the reader's understanding of the material presented and are not necessarily the final formats that will actually be displayed.

6.1.5. Verification

The integrity of the data in the data base must be maintained; therefore, any function involving manual entry or modification of data in the data base will be subject to verification (see subsection 6.2.4, Verifying Form Data).

To ensure the integrity of the data, the intentional entry of erroneous data will be prevented by prohibiting unauthorized access to the data base. This security will be provided through the use of passwords. Moreover, the protection of data integrity from human errors (e.g., typing or procedural errors) will be achieved by applying certain reasonability criteria to the entered information. These reasonability checks will detect an illegal data entry if:

- Alphabetic data is present in a field intended to be only numeric
- Numeric data is present in a field intended to be only alphabetic
- The number of alpha or numeric characters entered exceeds the size of the field where the information is to be stored
- The value of an entered number is outside the range that is normally expected.

To implement the last check, maximum and minimum value criteria for each numeric data entry must be prespecified by the Watch Supervisor and stored in the data base. Whenever data is entered or modified, the value will be checked against these criteria. The criteria itself may be set or changed only by using the Watch Supervisor station, and only with the use of special passwords to gain access to these criteria values.

Each line of data on a form will be verified as soon as it is typed (i.e., as soon as carriage RETURN is pressed), although the data is not actually entered into the data base until the entire form is completed and ENTER is pressed.

The system will respond to an unreasonable entry within 0.5 seconds by displaying the appropriate error message next to the entry and moving the cursor to the beginning of the entry in preparation for correction by the watchstander. In addition, a brief but noticeable alarm will be sounded and the entry will flash to alert the watchstander.

If the watchstander feels that the entry is not in error, the error statement may be ignored by manually moving the cursor to the next item to be entered and continuing to fill in the form. The unreasonable entry will then stop flashing; however, an asterisk will be placed in the left-hand column and the error message will continue to be displayed. If the operator is attempting to replace a reasonable entry with an unreasonable entry, the reasonable entry will be displayed in parentheses next to the error message.

When the data entry form is completed and the operator presses ENTER, all reasonable entries will be entered into the data base unless an error remains in the vessel name. In this case, no entries are made and the entire form is held for Watch Supervisor action. However, upon successful data entry, the alphanumeric display of the station entering the data will display an acknowledgment that the data transfer is complete.

If the watchstander attempts to override the reasonability criteria and enter an erroneous data item(s), the following will occur:

- The incorrect entry (or entries) will not be stored in the data base
- The acknowledgment to the watchstander will indicate the item(s) not entered and that control of these items has passed to the Watch Supervisor for action
- An ACTION REQUIRED indicator at the Watch Supervisor station will illuminate.

The Watch Supervisor will respond to the ACTION REQUIRED indicator by pressing ACKNOWLEDGE. The subsystem will then respond by displaying the following information on the Watch Supervisor's alphanumeric display:

- A description of the problem (e.g., INPUT ERROR BY STATION #, etc.)
- The name and type of the vessel involved
- The entries found to be unreasonable
- The reasonability test failed for each erroneous entry
- Where an entry is a number, the normal range of that number.

The Watch Supervisor may, or may not, change any erroneous entry and press ENTER. This data is then entered into the data base, joining the data already entered by the watchstander. There are no further reasonability checks performed; that is, the Watch Supervisor has the authority to override the reasonability criteria, if desired.

Whenever the Watch Supervisor is the originator of a function involving entry of data into the data base (in lieu of a watchstander), the same criteria will be applied as if a watchstander were entering to the point where, because of unreasonable entries, control would normally have passed to the Watch Supervisor for action. At this point, since the Watch Supervisor is already in control, the system will ask "Do you wish to override the criteria?" If the response is YES, the data will be entered into the data base; if NO, the Watch Supervisor will be given another opportunity to modify the questionable entries before entry into the data base.

6.1.6 Escape

An ESCAPE key will be provided to abort any operation in progress. Use of this escape will immediately allow an operator to terminate a function with no consequence. Until the operator invokes another function, the system will place the station in a ready state where only background processing continues. This may be used in cases where it is realized that the wrong function was invoked, or an incorrect entry or procedure has been made. It may not be used in transitory notification states where no operator action is accepted by the system.

6.1.7 Chaining of Functions

When an operator is performing several sequential data base functions on the same vessel, rather than forcing the operator to go through the same vessel identification process for each function, the system will provide a PREVIOUS VESSEL capability. In which case, when the system prompts the operator to identify the vessel, he may type PREVIOUS VESSEL (or an appropriate mnemonic). The system will then invoke the new function with the previous vessel pre-established as the identified vessel.

6.1.8 Save and Recall

If an operator is in the midst of performing one function when some other function(s) must be used (e.g., an alert response), the system will provide a SAVE function capability. It can be repeated (nested) for a preset number of times. This capability will permit the operator to save all displayed and entered data in the function in progress and then to invoke as many other functions as are needed. Return to the saved function after completion of the intervening function(s) will be accomplished by pressing RECALL, whereupon the operator may resume at the same state in the original function.

SAVE may be pressed in all states except transitory, notification type states in which the subsystem acknowledges an operator action and automatically reverts to the ready state.

Figure 6-1 depicts the SAVE and RECALL functions described below.

- State 1 is any state where the system is expecting an action by the watchstander. This includes States 2 and 5 since the SAVE call is recursive.

- State 2 is the ready state of a new function which is entered when SAVE is pressed during a function and exited when RECALL is pressed after the intervening function is completed.

- State 3 is entered from State 1 when the nesting of SAVE functions is too deep. The watchstander is notified and the system automatically returns to State 1.

- State 4 is notification to the watchstander that an invalid function call was entered in State 2. The system automatically returns to State 2 to allow reentry of a valid function.

- State 5 is the function processing state of the intervening function. It is entered from State 2 when a valid function call is made and exited to State 2 when the processing is completed.

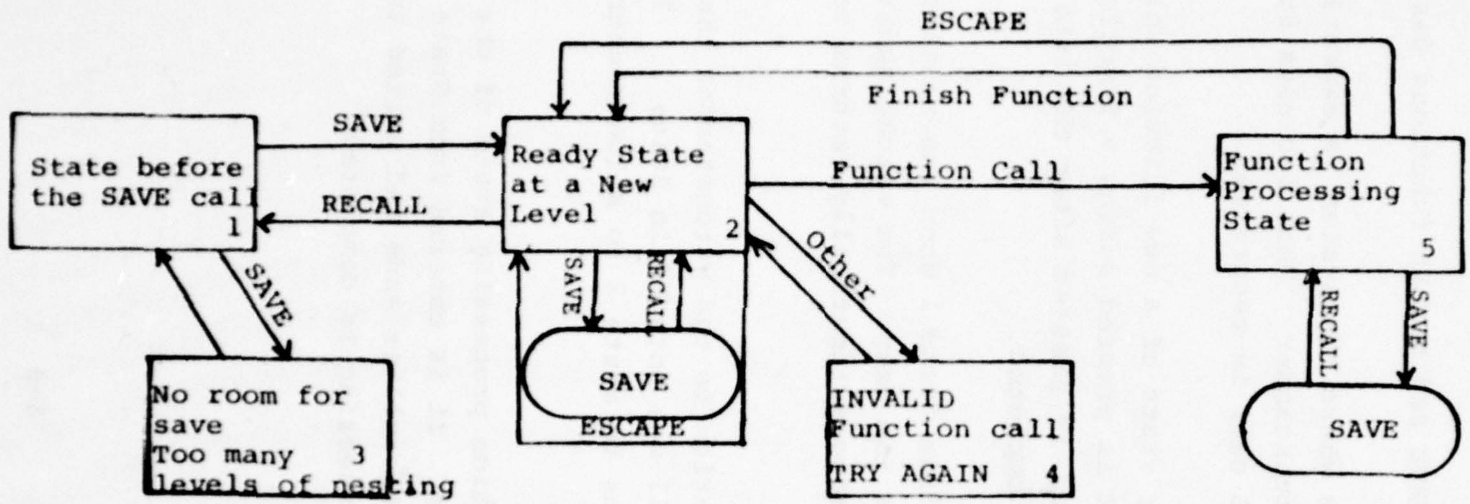


Figure 6-1. Save and Recall

6.2 TOP LEVEL STATES OF OPERATOR INVOKED FUNCTIONS

The possible states of a watchstander's display station and the classes of actions which will transform the station from one state to another are depicted in Figure 6-2 and described in detail below. These top level states should be studied carefully since they are the foundation of all the state diagrams of the operator invoked functions. The following subsections (6.2.1-6.2.4) represent a break down of some of these top level states into substates which are imbedded in several of the functions.

- <u>State 1 - Inactive State</u>

  When the watchstander's display station is in the inactive state, the display station will respond to a valid SIGN IN function by entering the ready state (State 2). All other functions will be rejected.

  If the system is in the ready state (State 2) and the watchstander presses OFF, the display station will be inactive again.

- <u>State 2 - Ready State</u>

  The system enters the ready state after the watchstander types a valid password from the inactive state or after a function is completed. READY STATE appears on the alphanumeric display upon entering this state. Possible watchstander actions and the resultant transformations are:

  - Valid function call (Enter State 6)
  - Illegal action (Enter State 5)
  - SAVE (Enter State 3)
  - OFF (Enter State 1)

  The system may only be turned off from State 2. If there is only SAVE on the stack, the

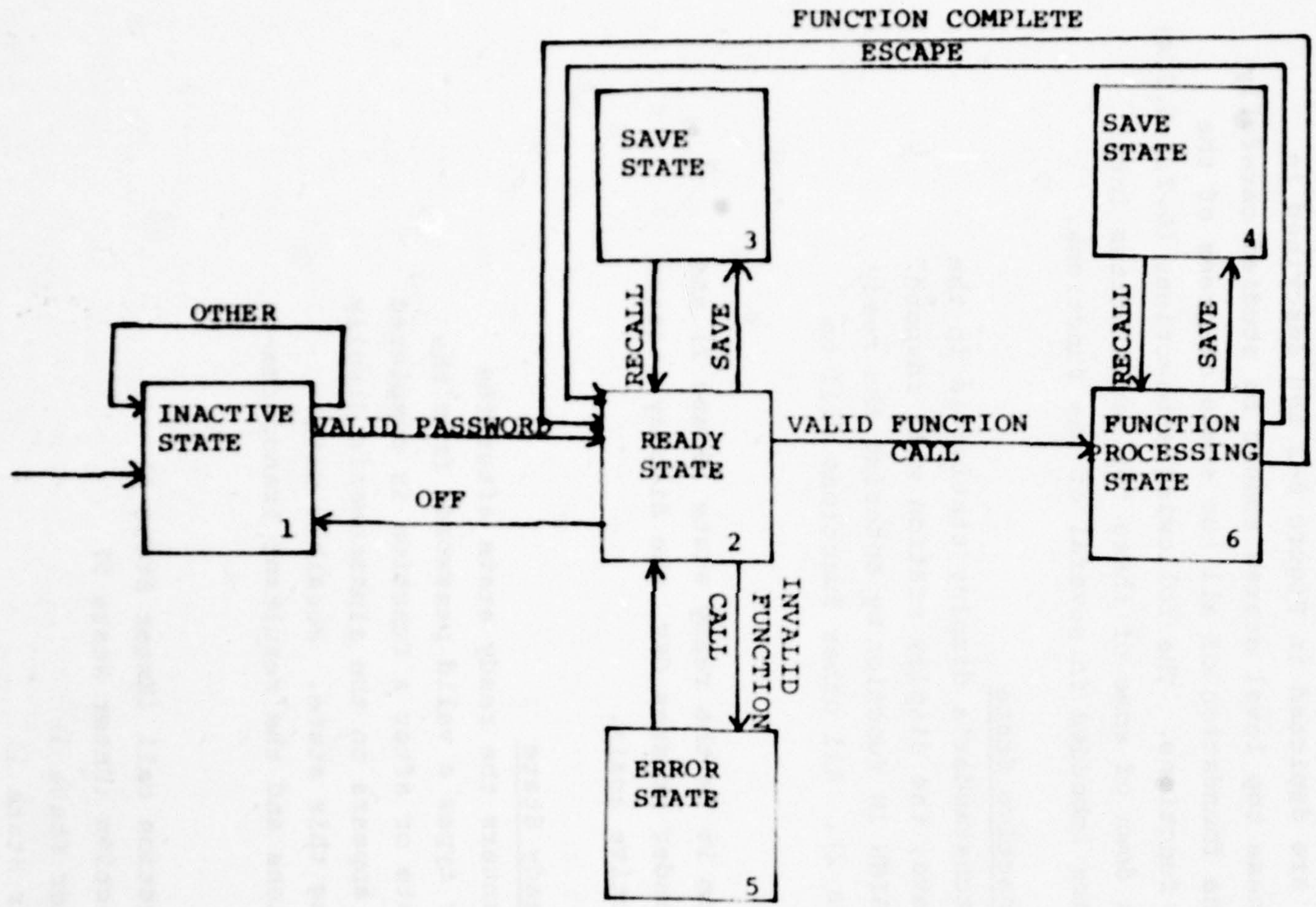


Figure 6-2. Top Level Diagram of the Operator Invoked Functions

watchstander must perform a RECALL to return to the ready state. If the system is in State 6, an ESCAPE must be performed before the OFF is called.

- State 3 and 4 - Save State
  The Save State is entered when SAVE is pressed in either State 2 or 6. The previous State (2 or 6) is returned to when the preempting function is completed and RECALL is pressed. (See subsection 6.1.8, Save and Recall.)

- State 5 - Error State
  State 5 is entered whenever the watchstander enters an invalid function in State 2. The system is immediately returned to the Ready State after displaying an error message.

- State 6 - Function Processing State
  The function processing state is entered when the watchstander presses a valid function key in the ready state (State 2). Return to the ready state occurs when the function is completed or an ESCAPE is entered. The states which constitute the function processing state are delineated in subsection 6.2.1, Function Processing. Legal use of the SAVE and RECALL functions within this state is discussed in subsection 6.1.8, Save and Recall.

6.2.1 Function Processing State (Top Level State 6)

Several states constitute the Function Processing State (State 6) described in Section 6.2, Top Level States of Operator Invoked Functions. These function processing states are shown in Figure 6-3 and described in detail below.

6.2.1.1 State 1 - Ready State

The ready state is the normal state of the display. It is exited whenever a function key is pressed by the watchstander and is returned to automatically when the function is completed or an ESCAPE is entered.

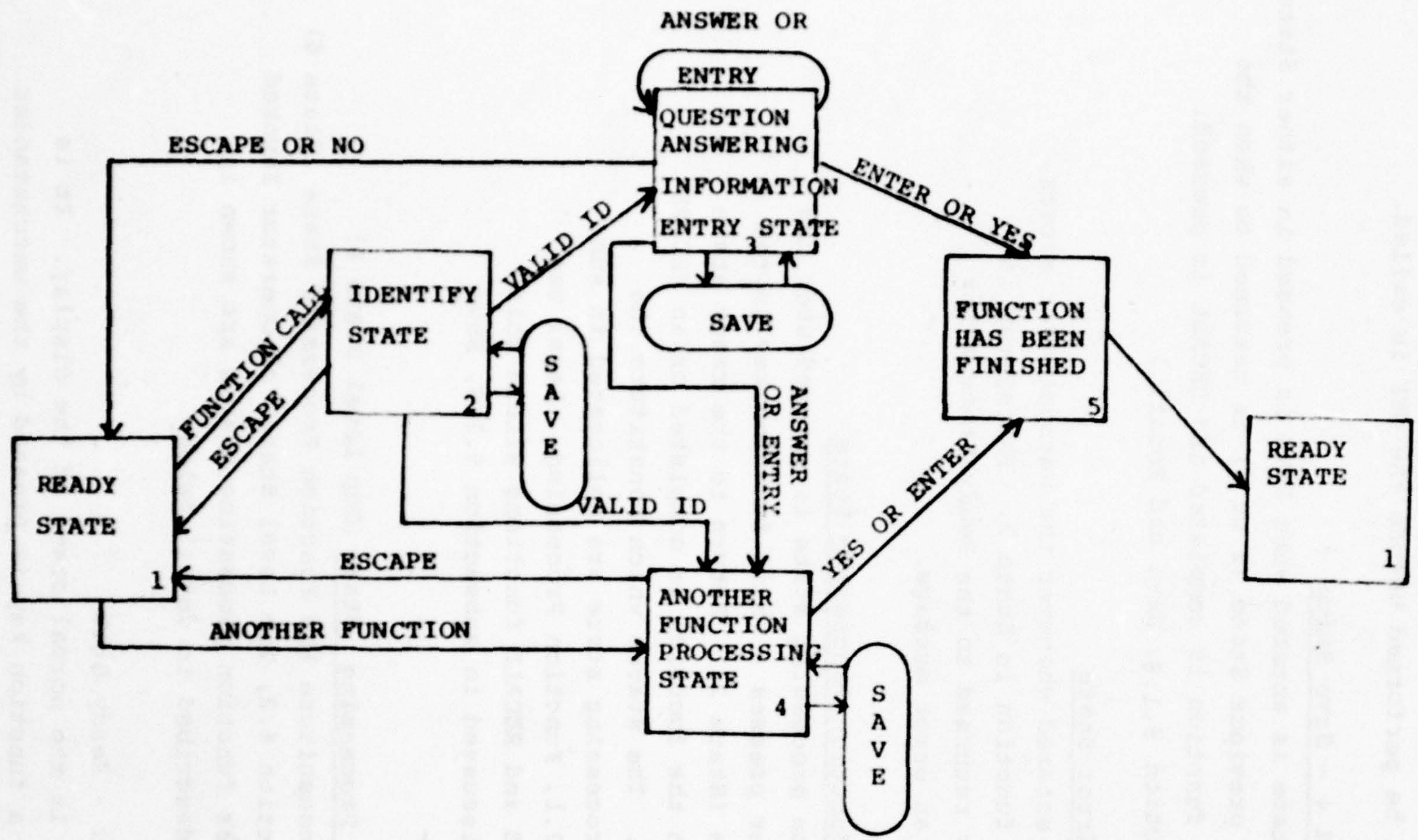


Figure 6-3. Function Processing (State 6)

The function call transforms the system from the ready state to the identify state (State 2).

6.2.1.2 State 2 - Identify State

After the function key is pressed in the ready state, the watchstander must identify the specific object (e.g., vessel, file, location, etc.) on which the function is to be performed. The name of the function will appear in the upper left-hand corner of the display. Possible watchstander actions and the resultant transformations are:

- SAVE (see Subsection 6.1.8)

- ESCAPE (Enter State 1)

- Valid identification (Enter State 3 or State 4 if the identification sends the system to another processing function. For example, identifying a vessel which is already in the vessel file during ENTER VESSEL will switch the function to MODIFY VESSEL, as discussed in Subsection 6.2.2).

- Illegal response (Remain in State 2)

6.2.1.3 State 3 - Question Answering State

Following a valid identification compatible with the given function, the display will show either a standard form (e.g., a passage or vessel record), possibly with some entries filled in, or a question (e.g., DO YOU WANT TO DELETE THIS RECORD?). Possible watchstander actions and the resultant transformations are:

- SAVE (see Subsection 6.1.8)

- ESCAPE or NO (Enter State 1)

- Valid response

  - Usually this will leave the system in the same state, ready to continue filling in more entries or answering more questions.

  - Some answers or entries may send the system to another function processing state (State 4). For example, changing the name of the vessel during MODIFY VESSEL could send the system to the ENTER VESSEL function if the change is not already in the vessel file.

  - ENTER or YES (Enter State 5 if valid entry).

- Illegal Response (Remain in State 3).

6.2.1.4 State 4 - Another Function Processing State
Certain watchstander actions in States 2 and 3 will send the system to Another Function Processing State (State 4). For example, in State 2, identifying a vessel which is already in the vessel file during ENTER VESSEL will switch the function to MODIFY VESSEL. And in State 3, changing the vessel name during MODIFY VESSEL to a name not previously entered will send the system to the ENTER VESSEL function.

6.2.1.5 State 5 - Function Completed State
After pressing ENTER or YES in State 3, the function may no longer be cancelled by an ESCAPE and State 5 is entered. This state is a temporary state in which the system notifies the watchstander that the function has been completed and then automatically reverts to the ready state.

6.2.2 Specifying a Vessel

The Specify Vessel state (see Figure 6-4) identifies a particular vessel in the vessel or passage file by its unique reference. The watchstander selects an identification method and then enters the vessel reference.

The substates which follow delineate the various techniques for specifying a vessel. The appropriate function will appear at the left-hand corner of each display. The SAVE and ESCAPE function may be used in all substates except transitory ones.

- **Substate A - Select Reference Method**

  The watchstander must select the method by which the vessel reference will be entered from the list appearing on the display.

Display:

```
Function Name
Choose one of the following reference methods:

1.  Name
2.  Registry or hull number
3.  Call sign
4.  First three letters and *
5.  Hook vessel
6.  Vessel identification code
```

(The vessel identification code method number 6 is provided only on passage file functions, excepting the ENTER PASSAGE function).

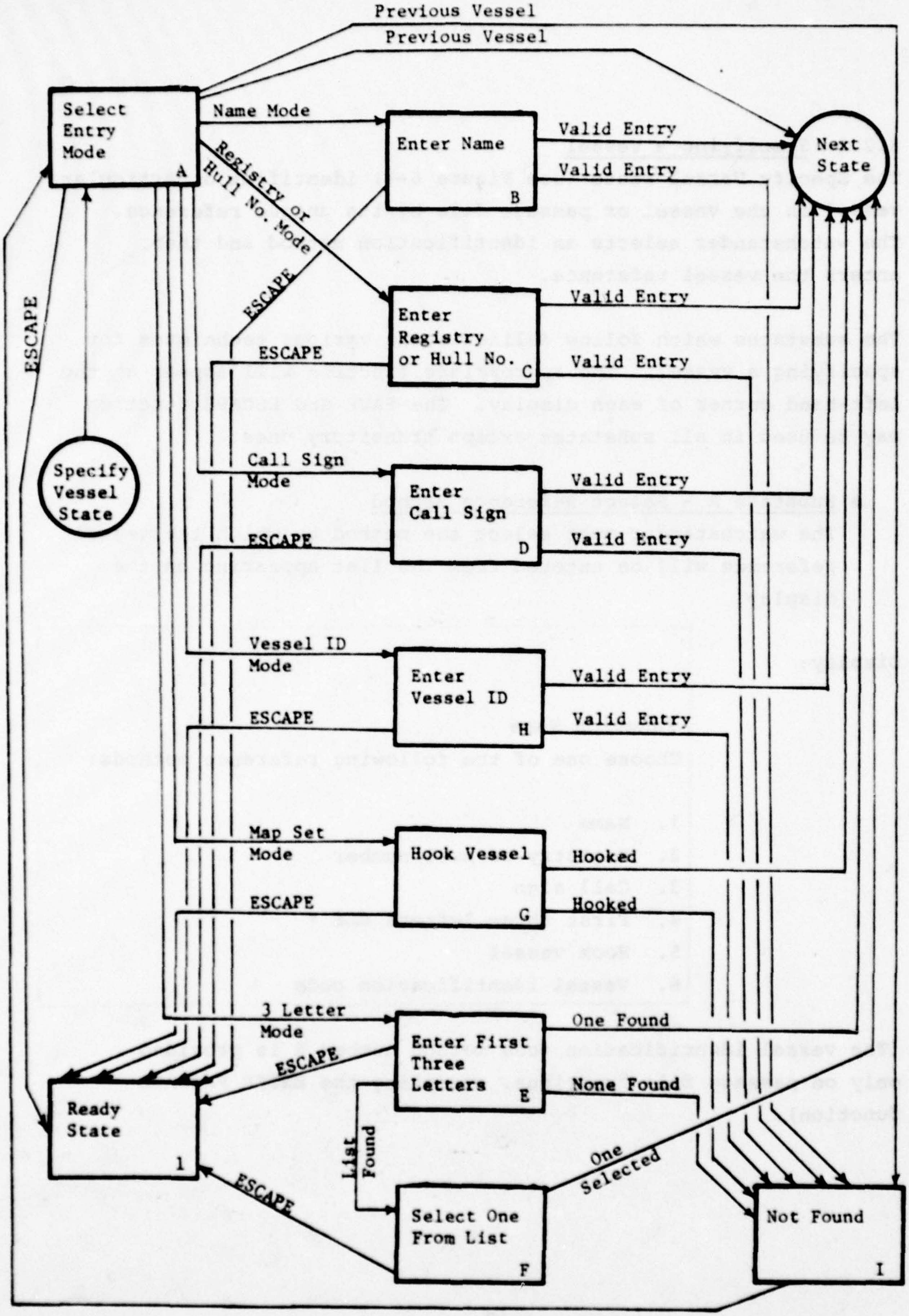


Figure 6-4. SPECIFYING A VESSEL

Actions: The watchstander will fill in one of the legal values: 1, 2, 3, 4, 5, or 6 if it is a passage file function other than ENTER PASSAGE. ESCAPE or an illegal value may also be entered. If an illegal value is entered, the system will clear the entry, display INVALID RESPONSE and wait for the entry of a legal value or an ESCAPE.

Entered From	When
Previous state	Valid action entered

Exit To	When
B	List entry number 1 entered
C	List entry number 2 entered
D	List entry number 3 entered
E	List entry number 4 entered
G	List entry number 5 entered
H	List entry number 6 entered
Ready State	ESCAPE

- Substates B, C, D, E, G, H - Enter Reference
The watchstander must enter the vessel reference in terms of the method selected. He will fill in the vessel's name in B, enter the Lloyd's registry or military hull number in C, enter the radio call sign in D, enter the first three letters of the vessel's name and * in E, hook the vessel symbol in G, and enter the vessel identification code in H, if appropriate. In Substate G, the vessel symbol may be hooked by using the trackball cursor positioning device.

The watchstander may use the PREVIOUS VESSEL function to re-establish the vessel referenced in the last function performed, or he may enter an ESCAPE. If an illegal response is entered, the system will clear the entry, display INVALID RESPONSE and await a new entry or an ESCAPE.

Entered From	When
A	Reference method selected

Exit To	When
Next state	Vessel found
F	More than one vessel with 3 letters in Substate E
Ready State	ESCAPE
I	Vessel not found

Note: It is possible that a vessel may be in the Vessel File but not in the Passage File. If the operator performs a Vessel File function on the vessel and then invokes a Passage File function, identifying the vessel by PREVIOUS VESSEL, the system will go to Substate I.

- Substate F - Select from List

  The list of vessels with names beginning with the same three letters specified in substate E is displayed.

Display:

```
Function Name

Choose one of the following:
   1.
   2.
   .          list of vessels whose
   .          names begin with the
   .          3 letters
   n
```

Actions: The watchstander will fill in the list entry number of the vessel desired, or he may enter an ESCAPE. If an illegal response is entered, the system will clear the entry, display INVALID RESPONSE and await a new entry or an ESCAPE.

Entered From	When
E	More than 1 vessel name with 3 letters

Exit To	When
Next State	Vessel found
I	Vessel not found
Ready State	ESCAPE

- <u>Substate I - Vessel Not in File</u>
  The watchstander is notified that the vessel specified is not on file.

Display:

```
Function Name
The vessel is not in (Vessel/Passage)
File
```

Actions: The system will return to A and the watchstander must reidentify the vessel or ESCAPE.

Entered From	When
B, C, D, F, G, H	Vessel not found

Exit To	When
A	Automatic

6.2.3 Specifying a Location

The Specify Location state (see Figure 6-5) defines the parameters of a particular location associated with a given function. The watchstander selects a location method and then enters the location.

The substates which follow delineate the various techniques for specifying a location. The appropriate function will appear at the left-hand corner of each display. The SAVE and ESCAPE function may be used in all substates except transitory ones.

- Substate A - Select Location Method
  The watchstander must select the method by which the location will be entered from the list appearing on the display.

Display:

```
        Function Name
    Choose one of the following location methods
    1.  Enter Latitude and Longitude
    2.  Specify Landmark
    3.  Set position and map trackball

    _
```

Actions: The watchstander may fill in one of the legal values : 1, 2, or 3. If a 3 is entered, the map cursor is positioned and the SET key is pressed. ESCAPE or an illegal value may also be entered. If an illegal value is entered, the system will display INVALID RESPONSE and wait for the entry of a legal value or an ESCAPE.

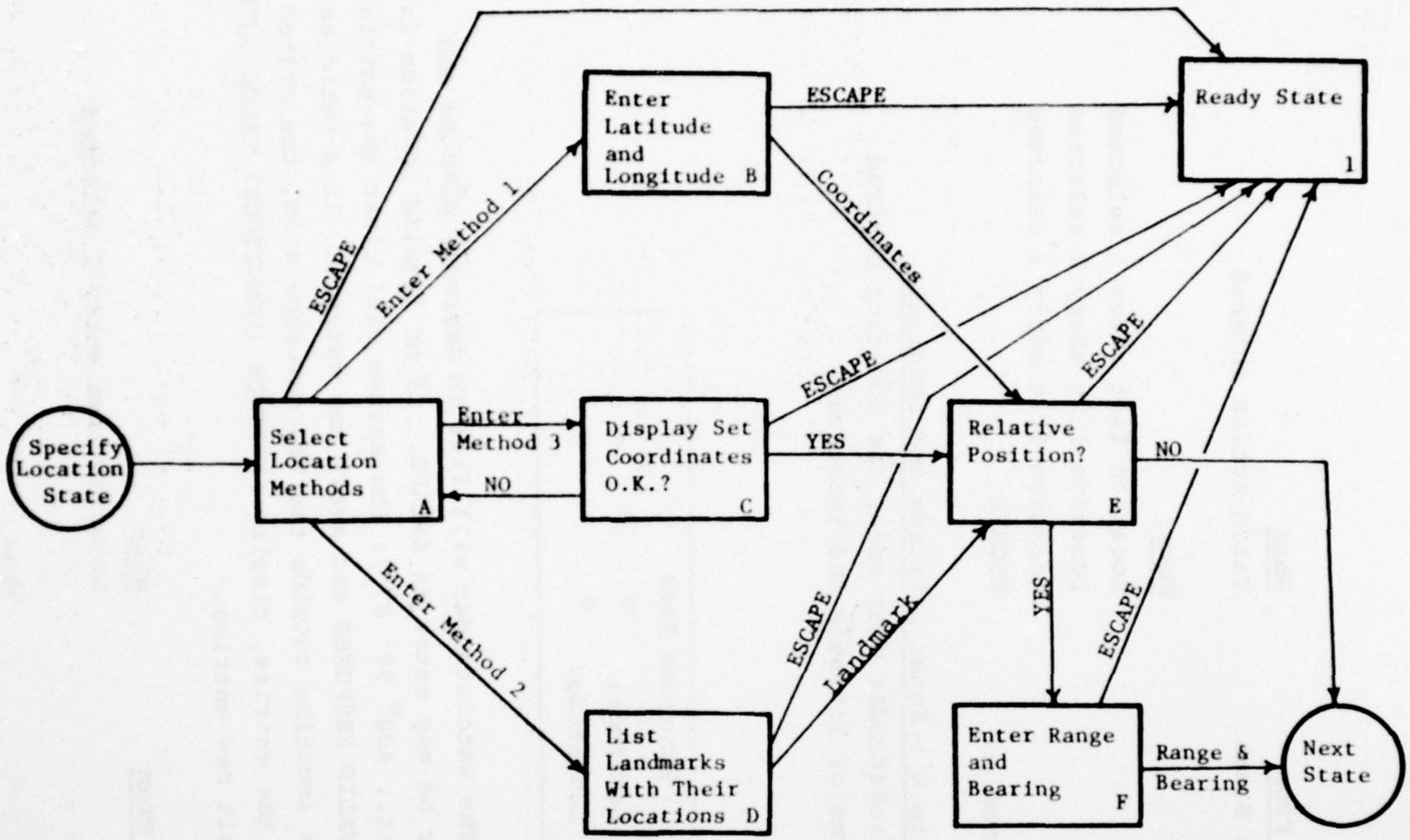


Figure 6-5. SPECIFYING A LOCATION

Entered From	When
Previous State	Valid action entered

Exit To	When
B	Location list entry 1 selected
D	Location list entry 2 selected
C	Location list entry 3 selected
Ready State	ESCAPE

- Substate B - Enter Latitude and Longitude

  The watchstander must enter the location desired in terms of latitude and longitude.

Display:

```
   Function Name
               o     '     "
Latitude:
               o     '     "
Longitude:
```

Actions: The watchstander will fill in degrees, minutes and seconds, or he may enter an ESCAPE. If an invalid location is entered (e.g., 400° 90' 87"), the system will clear the entries, display INVALID RESPONSE and await new entries. If a valid entry specifies a location outside the VTS coverage area, the system will clear the entries, display LATITUDE (LONGITUDE) VALUE OUTSIDE VTS and await new entries.

Entered From	When
A	Location list entry 1 selected

Exit To	When
E	Valid latitude/longitude entered
Ready State	ESCAPE

- Substate C - Display Set Coordinates

  The previously set latitude and longitude coordinates are displayed to allow verification of accuracy.

Display:

```
Function Name
Coordinates set are:
Latitude:  dd°mm'ss"
Longitude:  ddd°mm'ss"
Is this position as desired?

_
```

Actions: The watchstander will respond by pressing YES or NO depending on the accuracy of the coordinates, or he may enter an ESCAPE. If an illegal response is entered, the system will display INVALID RESPONSE and await a new entry.

Entry From	When
A	SET pressed

Exit To	When
E	YES entered
A	NO entered
Ready State	ESCAPE

- Substate D - List Landmarks

  The watchstander must enter the location desired in terms of predefined landmarks.

Display:

```
Function Name
Choose one of the following landmarks:
       NAME        LATITUDE      LONGITUDE
1.   name,        dd°mm'ss"     ddd°mm'ss"
.      .              .              .
.      .              .              .
.      .              .              .
n      .              .              .
_
```

If more landmarks than will fit on screen they may roll this list up or down

Actions: The watchstander will fill in the list entry number of the chosen landmark, or he may enter an ESCAPE. If an illegal response is entered, the system will clear the entry, display INVALID RESPONSE and await a new entry.

Entered From	When
A	Location list entry 2 selected

Exit To	When
E	Valid entry number entered
Ready State	ESCAPE

- <u>Substate E - Relative Position?</u>
  The watchstander must determine if the position is relative.

Display:

```
Function Name
Is position relative?
_
```

Actions: The watchstander will respond by pressing YES or NO depending on the relativity of the position, or he may enter an ESCAPE. If an illegal response is entered, the system will display INVALID RESPONSE and await a new entry.

Entered From	When
B	Valid coordinates entered
C	YES pressed
D	Landmark list entry number entered

Exit To	Where
F	YES pressed
Next State	NO pressed
Ready State	ESCAPE

- Substate F - Enter Range and Bearing

  The watchstander must enter the bearing and range of the location desired.

Display:

```
Function Name
Enter Range and Bearing from position entered
RANGE(YARDS): _
BEARING:      °   '   "
```

Actions: The watchstander will fill in values for the range and bearing, or he may enter an ESCAPE. If a format error or an unreasonable value is entered (e.g., bearing value not in range of 0° to $359^{\circ}59'59"$), the system will clear the entries, display INVALID RESPONSE and await new entries.

Entered From	When
E	YES pressed

Exit To	When
Next State	Valid range and bearing values entered
Ready State	ESCAPE

6.2.4 Verifying Form Data

The Verifying Form Data state (see Figure 6-6) ensures that the watchstander enters reasonable system data concerning a designated vessel during a given vessel file or passage file function (excepting the delete and display functions in which no data is entered). Data entry checks occur after each carriage RETURN and when all data is entered. Leaving optional entries blank is a valid entry or entering a record with no changes is legal in a modify function.

The substates which follow verify the reasonability of the data to be entered. The appropriate function will appear at the left-hand corner of each display form. The SAVE and ESCAPE functions may be used in all substates except transitory ones.

Note: All of the other file functions receive specific error messages in response to an illegal entry rather than using this state due to the nature of the functions and the advantage of reduced software.

- Substate A - No Unreasonable Entries

  The partially filled or complete form with no unreasonable entries is displayed.

  The watchstander will fill in or change any data entry, press ENTER if no change is required or all data has been entered; or he may enter an ESCAPE. The system will calculate certain values based on other reasonable values (see the specific function for a discussion of system computed values).

Entered From	When
Previous State	One reasonable entry made
B	Unreasonable entry corrected
D	All unreasonable entries corrected

Exit To	When
C	Enter—All reasonable data entered
B	Unreasonable response entered
Ready State	ESCAPE

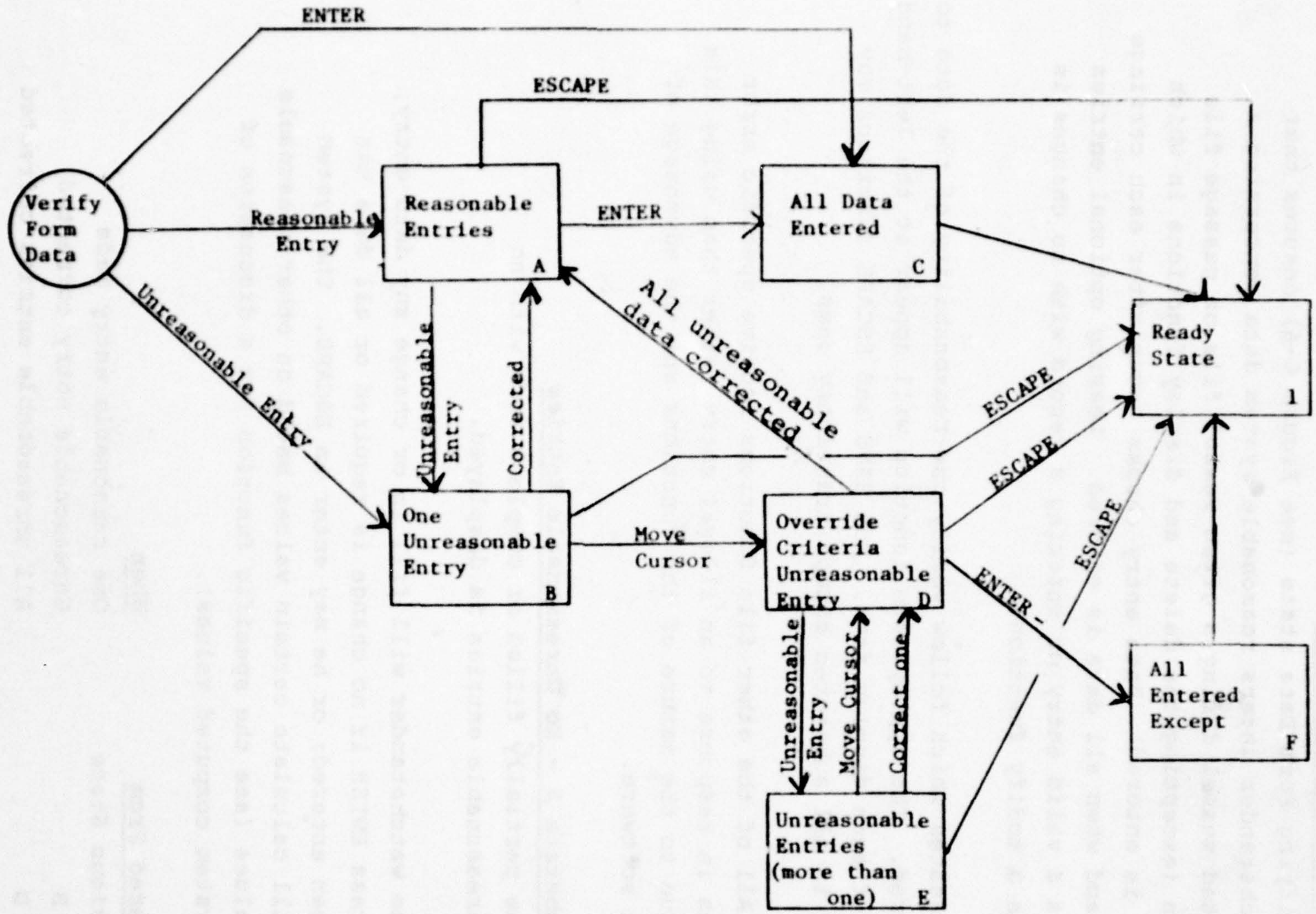


Figure 6-6. VERIFYING FORM DATA

- **Substate B - One Unreasonable Entry**

  After the carriage RETURN, if an unreasonable response has been entered, it will flash on the display to alert the watchstander.

  The watchstander will change the flashing data entry, possibly entering another unreasonable response, or he may enter an ESCAPE. If the change to the flashing entry is another unreasonable entry, the entry will remain flashing until corrected or an ESCAPE is entered. However, if the watchstander moves the cursor, the reasonability criteria are overridden.

Entered From	When
A	One unreasonable entry
Previous State	One unreasonable entry

Exit To	When
A	Unreasonable entry corrected
D	Cursor moved-reasonability criteria overridden
Ready State	ESCAPE

- **Substate C - All Data Entered**

  The watchstander is notified that all data for the vessel specified have been entered into the system.

Entered From	When
Previous State	ENTER - no changes
A	ENTER - reasonable data entered

Exit To	When
Ready State	Automatic

- <u>Substate D - Reasonability Criteria Overridden</u>

  If the watchstander overrides a flashing unreasonable entry by moving the cursor, the form remains displayed for further verification with an asterisk in the left hand column designating the erroneous entry (or entries).

  The watchstander will add to or change any entry on the form, possibly enter another unreasonable response, or he may enter an ESCAPE. Entering a reasonable value may cause an automatic change in another entry. If that entry was unreasonable, it will now be corrected by the system.

Note: The system could spontaneously revert to A if the Watch Supervisor alters the reasonability criteria.

<u>Entered From</u>	<u>When</u>
B	Move cursor-reasonability criteria overridden
E	One unreasonable entry corrected or cursor moved

<u>Exit To</u>	<u>When</u>
A	All unreasonable responses corrected
E	Unreasonable data entered
F	ENTER - Unreasonable data
Ready State	ESCAPE

- <u>Substate E - Unreasonable Entries</u>

  If another unreasonable response is entered, the most recent unreasonable entry will flash on the display to alert the watchstander and any other unreasonable responses (i.e., responses in which the criteria has been overridden) will appear with asterisks in the left hand column on the display.

The watchstander will change the flashing data entry, possibly entering another unreasonable response (in which case the system remains in substate E with the unreasonable entry flashing), move the cursor to override the reasonability criteria, or he may enter an ESCAPE.

Entering a reasonable value may cause an automatic change in another entry. If that entry was unreasonable, it will now be corrected by the system.

Entered From	When
D	Unreasonable data entered

Exit To	When
D	One unreasonable response corrected or Cursor moved
Ready State	ESCAPE

- Substate F - All Data Entered Except

  The system notifies the watchstander that all reasonable data for the vessel specified have been entered into the system and displays the unreasonable data excluded. The Watch Supervisor is notified of the attempt to override the reasonability criteria and is provided a list of the unreasonable data entries which he may or may not allow entry into the system.

Entered From	When
D	ENTER - unreasonable data

Exit To	When
Ready State	Automatic

7 VESSEL FILE FUNCTIONS

The vessel file functions allow the watchstander to enter, modify, delete and display system data concerning vessels which are expected to frequent a Vessel Traffic Service (VTS) area. Composed of vessel background information of an unchanging or slowly changing nature, this file should remain valid for several years. Its maximum capacity is 10,000 vessel records.

The vessel record (see Figure 7-1) will occupy three pages of the alphanumeric display. Reasonability criteria for each data field of the vessel record are listed below.

Reasonability Criteria:

Name	1.	25 characters
	2.	alphanumeric
Hull# or Registry#	1.	8 characters
	2.	alphanumeric
Call Sign	1.	6 characters
	2.	alphanumeric
Type	1.	10 allowed types or "other" $\leq$ 14 character alphanumeric
Gross Weight	1.	numeric
	2.	within predefined range.
Flag	1.	14 characters
	2.	alphanumeric
Owner	1.	36 characters
	2.	alphanumeric

name of vessel function

Vessel Name:

Lloyd's Registry or Military Hull Number:

Call Sign:

Type:

Gross Weight: (tons)

Flag:

Owner:

Maximum Speed: (knots)

Maximum Draft: (feet)

* *

Restricted space so that system can talk to W/S without displacing form.

The form can be rolled up or down on this portion of the screen.

The function name and system messages do not move.

Figure 7-1. Vessel Record (Page 1 of 3)

name of vessel function

Minimum Draft: (feet)

Beam: (feet)

Overall Length: (feet)

Overall Height at Minimum Draft: (feet)

Doctor Aboard Normally: (yes or no)

Local Agent:
Name:
Address:
Phone:

* *

Figure 7-1. Vessel Record (Page 2 of 3)

name of vessel function

Time Required for Crash Stop: (seconds)

Distance Required to Crash Stop: (feet)

Type of Navigational Equipment Aboard:

Number of Screws:

Minimum Turning Radius: (feet)

Date Data Last Verified:

Today's Date filled in

Comments:

* *

Figure 7-1. Vessel Record (Page 3 of 3)

Max Speed	1.	numeric
	2.	predefined range
Max Draft	1.	numeric
	2.	predefined range
Min Draft	1.	numeric
	2.	predefined range
Beam	1.	numeric
	2.	predefined range
Length	1.	numeric
	2.	predefined range
Overall Height	1.	numeric
@ Minimum Draft	2.	predefined range
Doctor	1.	yes or no
Local Agent		
Name	1.	36 characters
	2.	alphanumeric
Address	1.	45 characters
	2.	alphanumeric
Phone	1.	10 characters
	2.	numeric
Time Req. for		
Crash Stop	1.	numeric
	2.	predefined range
Distance Req.	1.	numeric
to Crash Stop	2.	predefined range

Navigation Equipment	1.	20 allowed types
Number of Screws	1.	numeric
	2.	predefined range
Minimum Turning Radius	1.	numeric
	2.	predefined range
Date Last Verified	1.	Date type
Comments	1.	160 characters

7.1 ENTER VESSEL

The Enter Vessel function allows the watchstander to enter a new vessel record into the vessel file. Any data item may be left blank on the vessel record except the vessel name.
Figure 7-2 depicts the ENTER VESSEL function described below.

7.1.1 State 1 - Ready State

See subsection 6.2.1.1, the Ready State.

7.1.2 State 2 - Enter Name of Vessel

- Substate 2A

A vessel record form is displayed.

Display: See Figure 7-1, the Vessel Record. (The current date will be filled in the Date Last Verified field.)

Actions: The watchstander may leave blank any data item except vessel name. When the watchstander types the vessel name and presses carriage RETURN, the system checks the vessel file to determine if this vessel has been previously entered. If a previous entry is found for the vessel, the system will retrieve and display the previously entered data and automatically switch to the MODIFY VESSEL function described in Section 7.2. If the valid vessel name has never been entered in the vessel file, the system goes to 4A.

Entered From	When
1	ENTER VESSEL pressed
Exit to	When
3	Vessel name already in vessel file
4A	New valid vessel name entered
2B	Unreasonable vessel name entered
1	ESCAPE

- Substate 2B

If an unreasonable vessel name is entered, the system will clear the entry, display VESSEL NAME REQUIRED, and await a new entry.

Display: See Substate 2A above.
Actions: The watchstander may attempt to override the reasonability criteria for vessel name by moving the cursor, which cancels the function call, but alerts the Watch Supervisor of the watchstander's attempt to enter an unreasonable vessel name into the vessel file. If desired, the watchstander may also enter an ESCAPE.

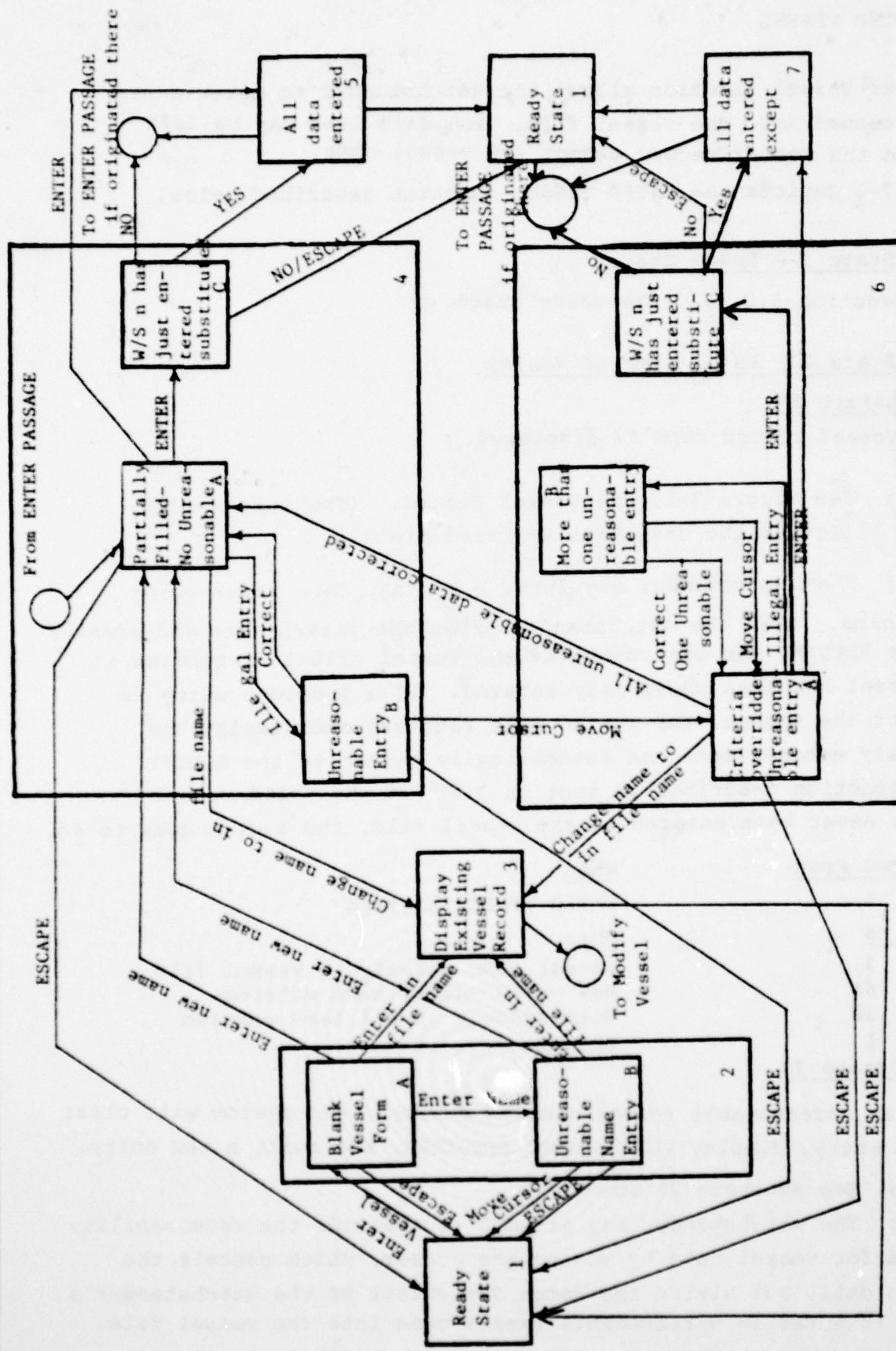


Figure 7-2. ENTER VESSEL

Entered From	When
2A	ENTER VESSEL pressed

Exit To	When
3	Vessel name already in vessel file
4A	New valid vessel name entered
1	ESCAPE or reasonable vessel name criteria overridden

7.1.3 State 3 - Display Existing Vessel Record

When the watchstander enters a vessel name already in the vessel file, the existing vessel record is displayed and the function name in the left-hand corner is changed from ENTER VESSEL to MODIFY VESSEL. MODIFY VESSEL flashes to alert the watchstander of the function change.

Display: See Figure 7-1, the Vessel Record.

Actions: See Section 7.2, the MODIFY VESSEL function.

Entered From	When
2A,2B,4A,6A	Duplicate vessel name entered

Exit To	When
MODIFY VESSEL	Duplicate vessel name entered
1	ESCAPE

7.1.4 State 4 - Partially Filled Record (No Unreasonable Entries)

- Substate 4A

  A vessel record is displayed with a reasonable name entry and the current date in the Date Last Verified field.

Display: See Figure 7-1, the Vessel Record.

Actions: The watchstander will add or change any entry on the display form, or he may enter an ESCAPE. When the watchstander presses carriage RETURN, the reasonableness of the data entry is checked. After all desired entries are added or changed, the watchstander will press ENTER. If the vessel name is changed to an existing vessel, the system will automatically go to State 3, the MODIFY VESSEL function. If the vessel name is changed to a new name not in the vessel file, the system will remain in Substate 4A until all data has been entered.

Entered From	When
2A/2B	New valid vessel name entered
ENTER PASSAGE	No vessel record in file
6A	All unreasonable data corrected

Exit To	When
3	Duplicate vessel name entered
4A	New valid vessel name entered
4B	Unreasonable response entered
4C	ENTER-Record already added to vessel file
5	ENTER-Reasonable data entered
1	ESCAPE

- Substate 4B

  If an unreasonable response is entered in State 4A, it is flashed on the display to alert the watchstander.

Display: See Figure 7-1, the Vessel Record.

Actions: The watchstander will change the unreasonable entry, possibly entering another unreasonable response (in which case the system will remain in 4B with the error flashing), or he may enter an ESCAPE. However, if the watchstander moves the cursor, the reasonability criteria are overridden.

Entered From	When
4A	Unreasonable response entered

Exit To	When
4A	Unreasonable entry corrected
6A	Move cursor-reasonability criteria overridden
1	ESCAPE

- Substate 4C

  If a record for the vessel specified was added to the vessel file by another watchstander after the initial state of this function, the values stored in the existing vessel record and the values entered by the watchstander are displayed.

Display: See Figure 7-1, the Vessel Record. (Each field will have two entries: the value stored in the vessel file and the value entered by the watchstander. At the bottom of the record the watchstander is asked if he would like to substitute his copy.)

Actions: The watchstander will press YES if his copy is to be substituted, NO if the copy on file is to be retained, or he may enter an ESCAPE.

Entered From	When
4A	ENTER-Duplicate vessel record entered after State 2

Exit To	When
5	YES pressed
1	NO pressed or ESCAPE
ENTER PASSAGE (3A)	NO pressed and function originated in ENTER PASSAGE

7.1.5 State 5 - All Data Has Been Entered

The watchstander is notified that all data for the vessel specified have been entered into the vessel file.

Display:

> All data for vessel ABC has been entered
> in the Vessel File.

Actions: None.

Entered From	When
4C	YES pressed
4A	ENTER pressed

Exit To	When
1	Automatic
ENTER PASSAGE (State 3A)	Function originated in ENTER PASSAGE

7.1.6 State 6 - Partially Filled or Complete Vessel Record (At Least One Unreasonable Entry)

- Substate 6A

  If the watchstander overrides a flashing unreasonable entry on the display by moving the cursor, the vessel record remains displayed for further verification.

Display: See Figure 7-1, the Vessel Record.

Actions: The watchstander will add to or change any entry in the form and press ENTER, or he may enter an ESCAPE. If the vessel name is changed to one that already exists, the system goes to State 3.

Entered From	When
4B	Reasonability criteria overridden
6B	One unreas.entry corrected or cursor moved

Exit To	When
3	Existing vessel name entered
4A	All unreasonable responses corrected
6B	Unreasonable response entered
7	ENTER-unreasonable data
1	ESCAPE
6C	ENTER-record already entered by another W/S

Note: The system could spontaneously revert to 4A if the Watch Supervisor alters the reasonability criteria.

- Substate 6B

Substate 6B corresponds to 4B except that there may be more than one unreasonable entry in 6B. Only the most recent unreasonable entry flashes; other unreasonable entries are designated with asterisks in the left hand column.

Entered From	When
6A	Unreasonable response entered

Exit To	When
6A	One unreasonable response corrected or cursor moved
1	ESCAPE

- Substate 6C

Substate 6C corresponds to 4C except that it is entered when the watchstander presses ENTER in 6A and it exits to 7 if the watchstander presses YES.

7.1.7 State 7 - All Data Entered Except

The system notifies the watchstander that all reasonable data for the vessel specified have been entered into the vessel file and displays the unreasonable data excluded.

Display:

```
All data for vessel ABC has
been entered in the Vessel
File except:
1.  Maximum Draft:   (feet)
        5000         TOO LARGE

2.

The Watch Supervisor has been
notified about these entries.
```

Actions: None.

Entered From	When
6A	ENTER-unreasonable response(s)
6C	YES

Exit To	When
1	Automatic
ENTER PASSAGE	Function originated in ENTER PASSAGE

7.2 MODIFY VESSEL

The Modify Vessel function allows the watchstander to change or add to a specified vessel record in the vessel file.

Figure 7-3 depicts the MODIFY VESSEL function described below.

7.2.1 State 1 - Ready State

See subsection 6.2.1.1, the Ready State.

7.2.2 State 2 - Specify Vessel

See Subsection 6.2.2, Specifying a Vessel.

7.2.3 State 3 - Display Vessel Record

The designated vessel record to be modified is displayed.

Display: See Figure 7-1, the Vessel Record.

Actions: The watchstander will change or add to any data entry, press ENTER if no change is desired, or he may enter an ESCAPE.

Entered From	When
2	Valid vessel identified
4A	New vessel name in file entered
6A	New vessel name in file entered
ENTER VESSEL	Duplicate vessel name entered

Exit To	When
4A	Reasonable change entered
4B	Unreasonable change entered
5	ENTER-no changes
1	ESCAPE

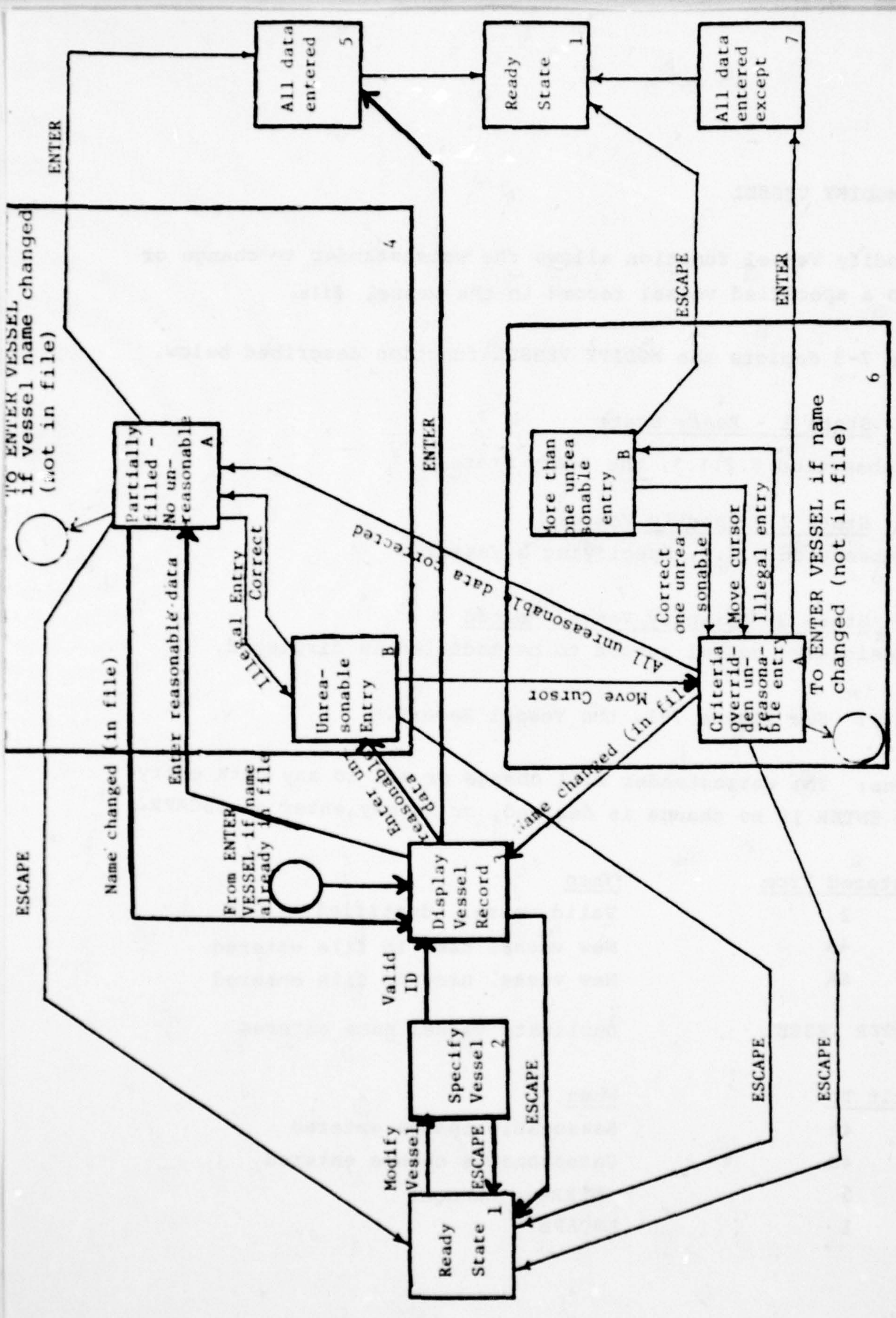


Figure 7-3. MODIFY VESSEL

7.2.4 State 4 - Modified Vessel Record

- **Substate 4A (No Unreasonable Entries)**
  The vessel record as changed is displayed with the value(s) of the field(s) before modification appearing in parentheses to the right of the modified value(s).

Display: See Figure 7-1, the Vessel Record.

Actions: The watchstander will add to or change any entry and press ENTER, or he may enter an ESCAPE. If the name entry is changed and the new name is not in the vessel file, the system will go to ENTER VESSEL; however, if the new name is in the vessel file, the system will return to state 3 to display the new vessel record.

Entered From	When
3	Reasonable change entered
4B	One unreasonable entry corrected
6A	All unreasonable data corrected

Exit To	When
3	New vessel name (in file) entered
4B	Unreasonable response entered
5	ENTER - all reasonable
1	ESCAPE
ENTER VESSEL	New vessel name (not in file) entered

- Substate 4B (One Unreasonable Entry)

  See subsection 7.1.4, Substate 4B, of the Enter Vessel function.

7.2.5 State 5 - All Data Has Been Entered

See subsection 7.1.5 of the Enter Vessel function.

Entered From	When
3	ENTER - No changes
4A	ENTER pressed

Exit To	When
1	Automatic

7.2.6 State 6 - Modified Vessel Record (One or More Unreasonable Entries)

- Substate 6A

  See subsection 7.1.6, Substate 6A, of the Enter Vessel function except that this substate goes to the ENTER VESSEL function when a new name that is not in the file is entered.

- Substate 6B

  See subsection 7.1.6, Substate 6B, of the Enter Vessel function.

7.2.7 State 7 - All Data Entered Except

See subsection 7.1.7 of the Enter Vessel function.

Entered From	When
6A	ENTER - Unreasonable data

Exit To	When
1	Automatic

AD-A078 390 INTERNATIONAL COMPUTING CO BETHESDA MD F/G 15/5
VESSEL TRAFFIC SERVICES PROCESSING/DISPLAY SUBSYSTEM SOFTWARE R--ETC(U)
SEP 79 C C HENSON, R S GRAHAM, B A MCINTOSH DOT-CG-81-78-1833

UNCLASSIFIED USCG-D-72-79 NL

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7.3 DELETE VESSEL

The Delete Vessel function allows the watchstander to delete a specified vessel record from the vessel file.

Figure 7-4 depicts the DELETE VESSEL function described below.

7.3.1 State 1 - Ready State

See Subsection 6.2.1.1, the Ready State.

7.3.2 State 2 - Specify Vessel

See subsection 6.2.2, Specifying a Vessel.

7.3.3 State 3 - Display Vessel Record

The designated vessel record to be deleted is displayed.

Display: See Figure 7-1, the Vessel Record. (At the bottom of the record, the system asks, "Do you want to delete this record?")

Actions: The watchstander will press YES or NO, or he may enter an ESCAPE.

Entered From	When
2	Valid vessel entered

Exit To	When
2	NO pressed
4	YES pressed
5	YES pressed but illegal deletion
1	ESCAPE

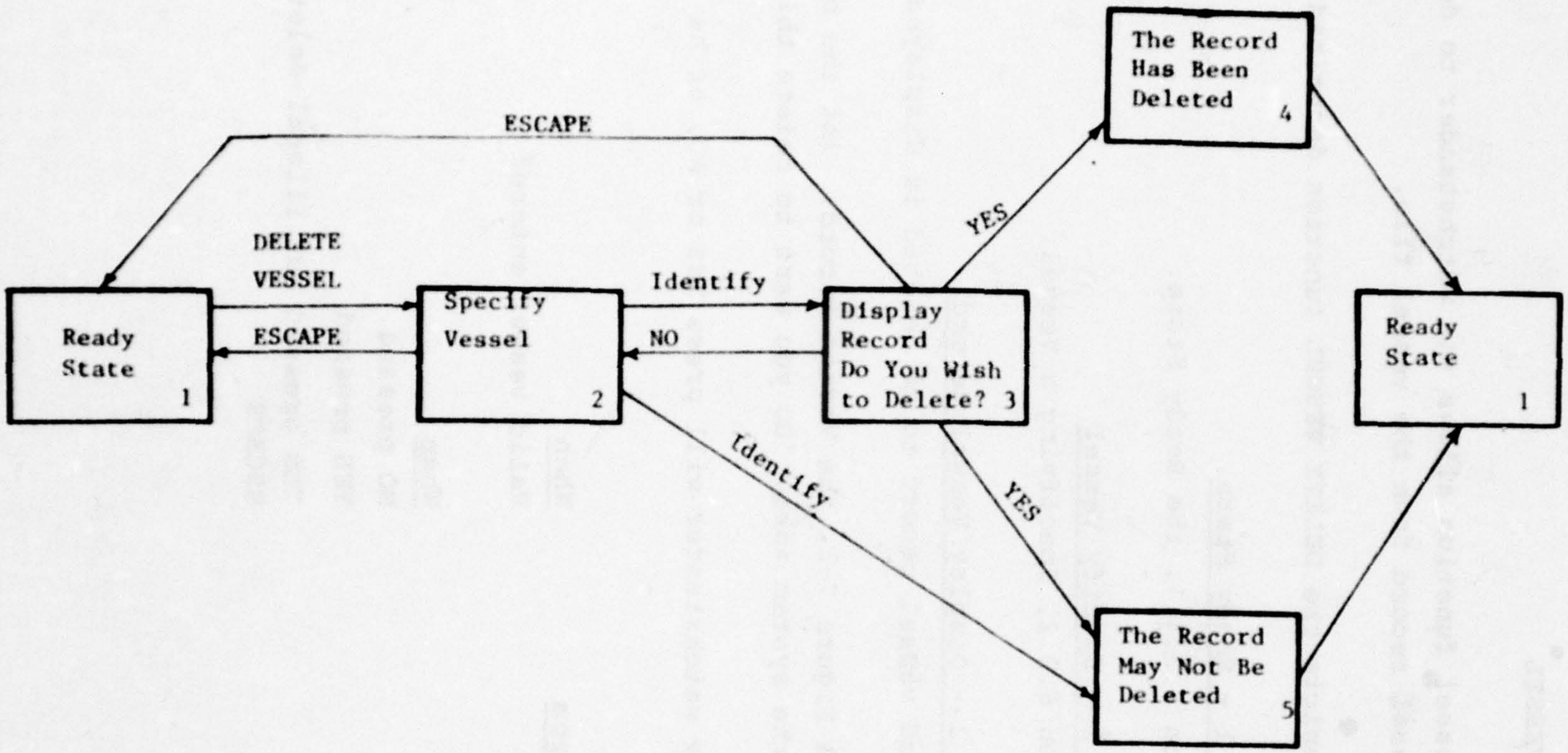


Figure 7-4. DELETE VESSEL

7.3.4 State 4 - Record Has Been Deleted

The system notifies the watchstander that the vessel record specified has been deleted from the vessel file.

Display:

```
The record for vessel ABC has been
  deleted
```

Actions: None.

Entered From	When
3	YES pressed

Exit To	When
1	Automatic

7.3.5 State 5 - Record May Not Be Deleted

The system notifies the watchstander that the vessel record specified may not be deleted because (1) another watchstander is currently viewing it, or (2) the vessel specified is still in transit within the VTS area.

Display:

```
The vessel record for ABC may not be
  deleted because
     reason
```

Action: None.

Entered From	When
3	YES pressed but illegal deletion

Exit To	When
1	Automatic

7.4 DISPLAY VESSEL

The Display Vessel function allows the watchstander to display a specified vessel record from the vessel file.

Figure 7-5 depicts the DISPLAY VESSEL function described below.

7.4.1 State 1 - Ready State

See Subsection 6.2.1.1, the Ready State.

7.4.2 State 2 - Specify Vessel

See Subsection 6.2.2, Specifying a Vessel.

7.4.3 State 3 - Display Vessel Record

The designated vessel record is displayed.

Display: See Figure 7-1, the Vessel Record. (All fields of the record are protected since a cursor does not appear on the display.)

Actions: None.

Entered From	When
2	Valid vessel entered

Exit To	When
1	Automatic

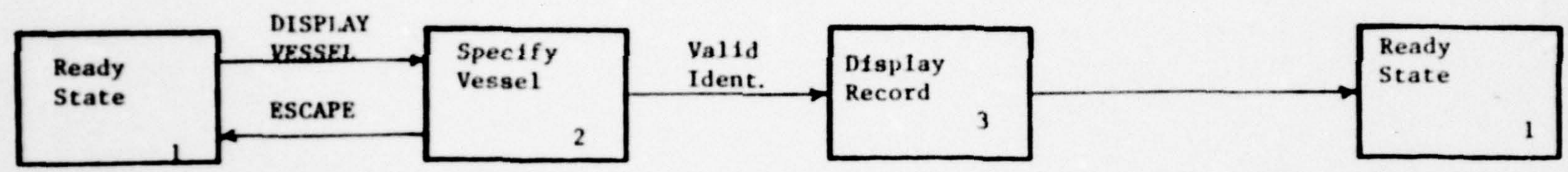


Figure 7-5. DISPLAY VESSEL INFORMATION

8 PASSAGE FILE FUNCTIONS

The passage file functions in this chapter allow the watchstander to enter, modify, delete and display system data concerning a particular passage through the VTS area. Capabilities are also provided to update a vessel's position, enter new communications, identify a vessel, modify a checkpoint (and/or view data for up to 50 checkpoints), and change the status of a passage.

A passage may be categorized as imminent (scheduled or expected to occur but not yet begun), underway (passage in progress), docked (at dock within the VTS area), or anchored (anchored within the VTS area). When a particular passage is completed, it will either be dropped from the file or in the case of recurring identical passages (e.g., ferries, etc.), be reinitialized and returned to the imminent status.

In systems having input from level 4 or 5 sensors (i.e., imminent and underway status), a passage file entry will be automatically initiated as soon as the sensors acquire the vessel even though no other information about the vessel is known. Such a vessel will be designated unidentified. (See Figure 8-1E for the record format for unidentified vessels.)

Identified vessels will, however, have priority over unidentified vessels. If the passage file has reached its maximum capacity (i.e., 2000 passage records) and space is required for newly acquired vessels, unidentified vessels will be dropped from the file beginning with size 1 vessels (smallest) to accommodate larger unidentified vessels or identified vessels of any size. The Watch Supervisor will be notified when the passage file is full and a note will be entered in the VTC operations log.

The complete passage record will occupy the five pages of memory allotted the display; however, a specific passage record will occupy two pages of the display.

The first page of the passage record form (see Figure 8-1) will contain information common to all vessels (i.e., imminent, underway, docked and anchored) in any system level. On the first line of the display will appear both the function being executed and the name of the vessel. (The name of the vessel is not an entry because modifying it on a passage record would necessitate change of the vessel file).

The data entries on the second page of the passage record form will be dependent on the status of the vessel. A different form of page 2 appears for levels 1,2, and 3 of underway and imminent (see Figure 8-1A); levels 4 and 5 of underway and imminent (see Figure 8-1B); anchored (see Figure 8-1C); and docked (see Figure 8-1D).

The reasonability criteria for each field of the passage records are listed below.

- Vessel Identification Code
  ≤ 4 alphanumeric characters

- Status
  1,2,3,4
  or imminent, underway, anchored, or docked

- Origin
  coordinates, description
  (May leave either field blank)
  coordinates -
  description ≤ 40 alphanumeric characters

Function name - vessel name

Vessel Identification Code:

Passage Status: (imminent, underway, anchored, docked)

Present Sector:

Origin or Point of Entry into VTS:

Destination or Point of Exit from VTS:

Date/Time of Entry into VTS Waterways:

Date/Time of Exit from VTS Waterways:

Pilot's Name or Designation:

Barge Makeup:

Cargo:

Actual Draft: (feet)

Figure 8-1. Page 1 of Passage Record

Designation of Last Checkpoint:

Date/Time at Last Checkpoint:

Estimated Speed of Advance Until Next Checkpoint: (knots)

Designation of Next Checkpoint:

Estimated Time of Arrival at Next Checkpoint:

Intended Route:

Figure 8-1A. Page 2 for Level 1, 2, 3 Imminent and Underway

Present Position:

Vessel Course:

Vessel Speed of Advance:

Intended Route:

Figure 8-1B. Page 2 for Level 4, 5 Imminent and Underway

Anchorage Designation:

Swing Radius of Mooring: (feet)

Location of Anchorage:

Date/Time Anchorage Established:

Date/Time of Scheduled Departure:

Intended Route:

Figure 8-1C. Page 2 for Anchored Vessels

Dock or Pier Designation:

Date/Time Arrived:

Date/Time of Schedule Departure:

Intended Route:

Figure 8-1D. Page 2 for Docked Vessel

Present Position of Vessel:

Vessel Course:

Vessel Speed of Advance:

Vessel Size:

Figure 8-1E. Passage Record for Unidentified Vessels

- <u>Destination</u>

  Same as Origin

- <u>Pilot's Name</u>

  ≤40 characters

- <u>Barge makeup</u>

  ≤40 characters

- <u>Actual Draft</u>
  - numeric
  - predefined range

- <u>Anchorage Designation</u>

  ≤14 alphanumeric characters

- <u>Swing Radius</u>
  - numeric
  - predefined range

- <u>Location of Anchorage</u>

  Same as Origin

- <u>Checkpoint Designation</u>

  ≤4 alphanumeric characters

- <u>Estimated Speed of Advance</u>
  - numeric
  - predefined range

- <u>Deck or Pier Designation</u>

  ≤14 alphanumeric characters

8.1 ENTER PASSAGE

The Enter Passage function allows the watchstander to enter a passage record concerning an identified or unidentified vessel (i.e., a vessel automatically acquired and tracked by the sensors at level 4 or 5 but not yet identified by name) into the passage file. A link between a sensor report and a particular vessel in the passage file is made either during the ENTER PASSAGE function as described in this section or during the IDENTIFY VESSEL function, described in Section 8.7.

Figure 8-2 depicts the ENTER PASSAGE function described below.

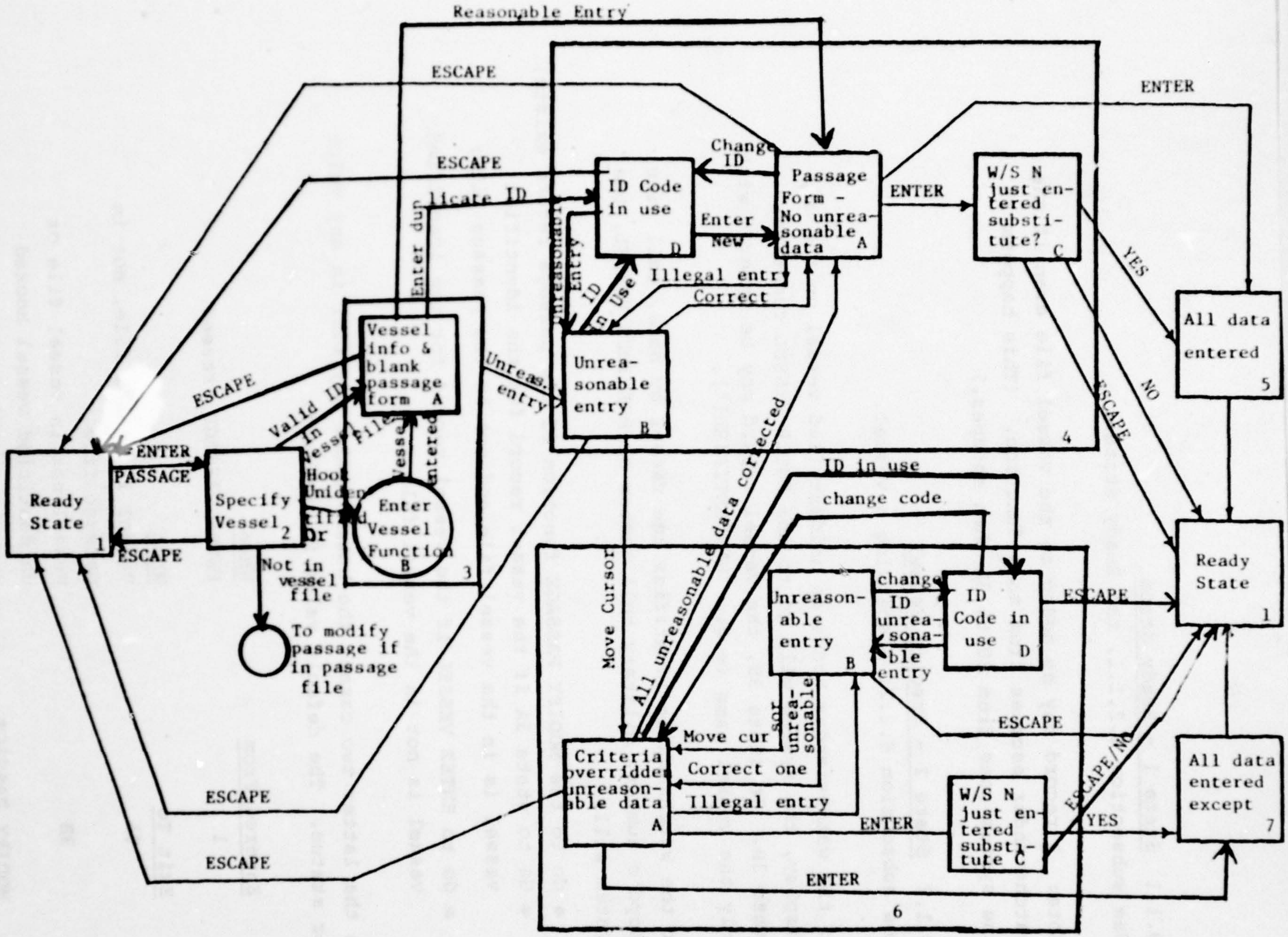


Figure 8-2. ENTER PASSAGE

8.1.1 State 1 - Ready State

See subsection 6.2.1.1, the Ready State.

Note: A record may be added to the vessel file even if the watchstander escapes from this function. (This happens if the system goes from 3B to 3A then escapes.)

8.1.2 State 2 - Specify Vessel

See subsection 6.2.2, Specifying a Vessel.

If the watchstander hooks an unidentified vessel on the map display, the system will go to the ENTER VESSEL function, state 3B. In state 3B, the vessel record may be entered with only the vessel name (e.g., "UNIDENTIFIED1").

If the watchstander identifies the vessel by name, call sign, Lloyd's number, military hull number or PREVIOUS VESSEL, the system will:

- Go to the MODIFY PASSAGE function if the passage record exists;
- Go to state 3A if the vessel record for the identified vessel is in the vessel file and not in the passage file;
- Go to ENTER VESSEL if the vessel record for the identified vessel is not in the vessel file.

In the latter two cases, the watchstander may fill in any value for status. The default value is imminent.

Entered From	When
1	ENTER PASSAGE pressed

Exit To	When
3A	Vessel in vessel file, not in passage file
3B	Vessel not in vessel file or unidentified vessel hooked
MODIFY PASSAGE	Vessel specified has a passage record

8.1.3 State 3 - Display Vessel Record Information

- <u>Substate 3A</u>

  If the vessel specified is in the vessel file and not in the passage file, the following vessel record information is displayed:

- Vessel identification code
- Vessel name
- Lloyd's registry number
- Radio call sign
- Type
- Gross weight
- Flag
- Overall length

Based on this information, the watchstander must determine if the desired vessel has been retrieved. If so, the passage record form is filled in.

Display: See Figure 8-1, the Passage Record.

The vessel identification code will be generated automatically during ENTER PASSAGE. Each vessel on the map display will have an accompanying label to specify this code. It consists of the first three letters of the vessel's name plus, if more than one vessel in the passage file has the same first three letters, a single additional digit (i.e., zero through 9) to distinguish between them. Once assigned, this code will not automatically change as other vessels having the same first three letters are added or deleted. For example, if all other vessels having the same first three letters are deleted from the passage file, the code of the remaining vessel will not automatically revert to the three letters alone, but rather it will retain the digit originally assigned to it to avoid confusion. The watchstander will, however, have the ability to specify his own code in lieu of the automatically supplied code at any time and may change it whenever desired. Thus, a more meaningful code than the automatically supplied code may be entered. Whenever the operator specifies a code, the system will always check to ensure that the code is unique to that vessel. If it is not, the watchstander will be asked for another code.

Actions: The watchstander will fill in the status and, if desired, change the identification code, or he may enter an ESCAPE. By pressing NEXT PAGE, the rest of page one and page two appear. After completing the passage record, the ENTER key is pressed.

Entered From	When
2	Vessel in vessel file not passage file
ENTER VESSEL (3B)	Automatic if originated in ENTER PASSAGE

Exit To	When
4D	ID code already in use
4B	Unreasonable data entered
4A	Reasonable data entered
1	ESCAPE

- Substate 3B

  If the vessel specified is not in the vessel file or is an unidentified vessel, the system will go to the ENTER VESSEL function and return to the ENTER PASSAGE substate 3A after 4, 5, 6, or 7 of the ENTER VESSEL function has been completed. If the watchstander enters an ESCAPE during the ENTER VESSEL function, the system will remain in the ready state and not return to the ENTER PASSAGE function.

Entered From	When
2	Identified vessel not in vessel file or Unidentified vessel hooked

Exit To	When
3A	ENTER VESSEL complete
1	ESCAPE

8.1.4 State 4 - Partially Filled or Complete Passage Record (No unreasonable entries)

- Substate 4A

  The partially filled or complete passage record to be entered is displayed.

Display: See Figure 8-1, the Passage Record.

Actions: The watchstander will fill in or change any data entry and press ENTER, or he may enter an ESCAPE. If the passage was specified by pointing to an unidentified radar blip, the status may not be changed to imminent. The status may, however, be altered except for this change. If altered, any entries made on the second page will be erased since each status type has different data fields.

Entered From	When
3A	Reasonable data entered
4B	Unreasonable entry corrected
4D	Valid ID code entered
6A	All unreasonable entries corrected

Exit To	When
5	ENTER
4B	Unreasonable data entered
4C	ENTER - Another watchstander entered passage specified
1	ESCAPE
4D	ID code in use entered

- Substate 4B

  If an unreasonable response is entered in state 4A, it is flashed on the display to alert the watchstander.

Display: See Figure 8-1, the Passage Record.

Actions: The watchstander will change the flashing erroneous data field, possibly entering another unreasonable response, or he may enter an ESCAPE. If the watchstander changes the identification code to one already in use, he will be notified of the duplication in state 4D. The system will remain in 4B with the unreasonable entry flashing until it is corrected or the cursor is moved. If the watchstander moves the cursor, the reasonability criteria are overridden. However, if the watchstander overrides an unreasonable ID code or status entry, the default value will be used.

Entered From	When
4A	Unreasonable response entered
4D	Unreasonable ID code entered

Exit To	When
4A	Unreasonable entry corrected
6A	Move cursor - reasonability criteria overridden
4D	Duplicate identification code entered
1	ESCAPE

- Substate 4C

  If a passage record for the vessel specified was added to the passage file after the initial state of this function, the values stored in the existing passage record and the values entered by the watchstander are displayed.

Display: See Figure 8-1, the Passage Record. (Each field will have two entries: the value stored in the passage file and the value entered by the watchstander. At the bottom of the record the watchstander is asked if he would like to substitute his copy).

Actions: The watchstander will press YES if his copy is to be substituted, NO if the copy on file is to be retained, or he may enter an ESCAPE.

Entered From	When
4A	ENTER - Duplicate vessel record entered after state 2

Exit To	When
5	YES pressed
1	NO pressed or ESCAPE

- Substate 4D

  If a reasonable identification code which is already in use is entered, the system notifies the watchstander and displays the duplicate identification code.

Display:

```
ENTER PASSAGE - vessel name
Identification code in use choose another.
code in use      (system default code)
```

Actions: The watchstander will change the identification code, or he may enter an ESCAPE. If a reasonable identification code is entered, the system returns to state 4A with the unique code entered and all the values previously entered.

If another reasonable identification code is entered which is already in use, the system will remain in 4D until it is corrected or an ESCAPE is entered.

Entered From	When
4A	Duplicate ID code entered
4B	Duplicate ID code entered
3A	Duplicate ID code entered

Exit To	When
4A	Reasonable ID code entered
4B	Unreasonable response entered
1	ESCAPE

8.1.5 State 5 - All Data Has Been Entered

The watchstander is notified that all passage data for the vessel specified have been entered into the passage file.

Display:

```
All data for vessel ABC has been entered
  in the Passage File.
```

Actions: If the vessel was specified by hooking an unidentified radar blip, the system will label the blip with the identification code.

Entered From	When
4C	YES pressed
4A	ENTER pressed

Exit To	When
1	Automatic

8.1.6 State 6 - Passage Record with One or More Unreasonable Entries

- Substate 6A

  If the watchstander overrides a flashing unreasonable entry by moving the cursor, the passage record remains displayed for further verification.

Display: See Figure 8-1, the Passage Record.

Actions: The watchstander will add to or change any entry in the form and press ENTER, or he may enter an ESCAPE.

Entered From	When
4B	Move cursor - reasonability criteria
6B	Correct an unreasonable entry or move cursor.
6D	New valid ID code entered

Exit To	When
6D	Duplicate ID code entered
4A	All unreasonable data corrected
6B	Unreasonable response entered
7	ENTER - unreasonable
6C	ENTER - another watchstander entered passage specified
1	ESCAPE

Note: The system could spontaneously revert to 4A if the Watch Supervisor alters the reasonability criteria.

- Substate 6B

  Substate 6B corresponds to 4B of this function except that there may be more than one unreasonable entry in 6B.

Entered From	When
6A	Unreasonable response entered
6D	Unreasonable ID code entered

Exit To	When
1	ESCAPE
6A	Move cursor or correct one unreasonable entry
6D	Duplicate ID code entered

- Substate 6C

  Substate 6C corresponds to 4C of this function.

Entered From	When
6A	ENTER - another W/S entered passage specified

Exit To	When
7	YES
1	NO/ESCAPE

- Substate 6D

  Substate 6D corresponds to 4D of this function.

Entered From	When
6A	ID code in use
6B	ID code in use

Exit To	When
6A	New valid code entered
6B	Unreasonable ID code
1	ESCAPE

8.1.7 State 7 - All Data Entered Except

The system notifies the watchstander that all reasonable passage data for the vessel specified have been entered into the passage file and displays the unreasonable data excluded.

Display:

All data for vessel ABC has been entered in the Passage File except:

Actions: If vessel was specified by hooking an unidentified radar blip, the system will label the blip with the newly established identification code.

Entered From	When
6A	ENTER
6C	YES

Exit To	When
1	Automatic

8.2 MODIFY PASSAGE

The Modify Passage function allows the watchstander to modify a passage record concerning a specified vessel in the passage file. The watchstander may modify any entry on the passage record except for the vessel name and data entered by automatic sensors.

Several of the entries in the passage file, if modified, will automatically generate other changes. These entries and the automatic system changes are listed below:

a) Vessel Identification Code - Will change the code of the label accompanying the vessel on the map displays to conform to the new code after ENTER is pressed.

b) Status - Will automatically send the system to the CHANGE STATUS function after ENTER is pressed.

c) Average Speed of Advance - Will automatically recalculate and enter a new Date/Time at Next Waypoint based on the current vessel position and the distance from that position to the next waypoint.

d) Estimated Time of Arrival at Next Waypoint - Will automatically calculate and enter a new speed of advance based on the distance from the vessel's current postion to the next waypoint.

e) Designation of Next Waypoint - Will cause the system to request that the operator enter a new speed of advance or a new time at next waypoint. The system will automatically calculate the entry the operator chose not to enter.

Figure 8-3 depicts the MODIFY PASSAGE function described below.

8.2.1 State 1 - Ready State

See subsection 6.2.1.1, the Ready State.

8.2.2 State 2 - Specify Vessel

See subsection 6.2.2, Specifying a Vessel.

8.2.3 State 3 - Display Passage Record

The passage record of the specified vessel is displayed.

Display: See Figure 8-1, the Passage Record.

Actions: The watchstander will change any data entry and press ENTER, or he may enter an ESCAPE. He may also enter the record with no changes.

Entered From	When
2	Valid vessel identified
ENTER PASSAGE	Vessel already in Passage File

Exit To	When
4A	Reasonable change entered
4B	Unreasonable change entered
5	No changes- ENTER
1	ESCAPE

8.2.4 State 4 - Modified Passage Record

This state corresponds to subsection 7.2.4 of the MODIFY VESSEL function except:

- The data will be entered in the passage file
- If the identification code is modified, the corresponding label is changed on the map display
- The vessel name may not be modified since it is not a data entry field on the passage record.

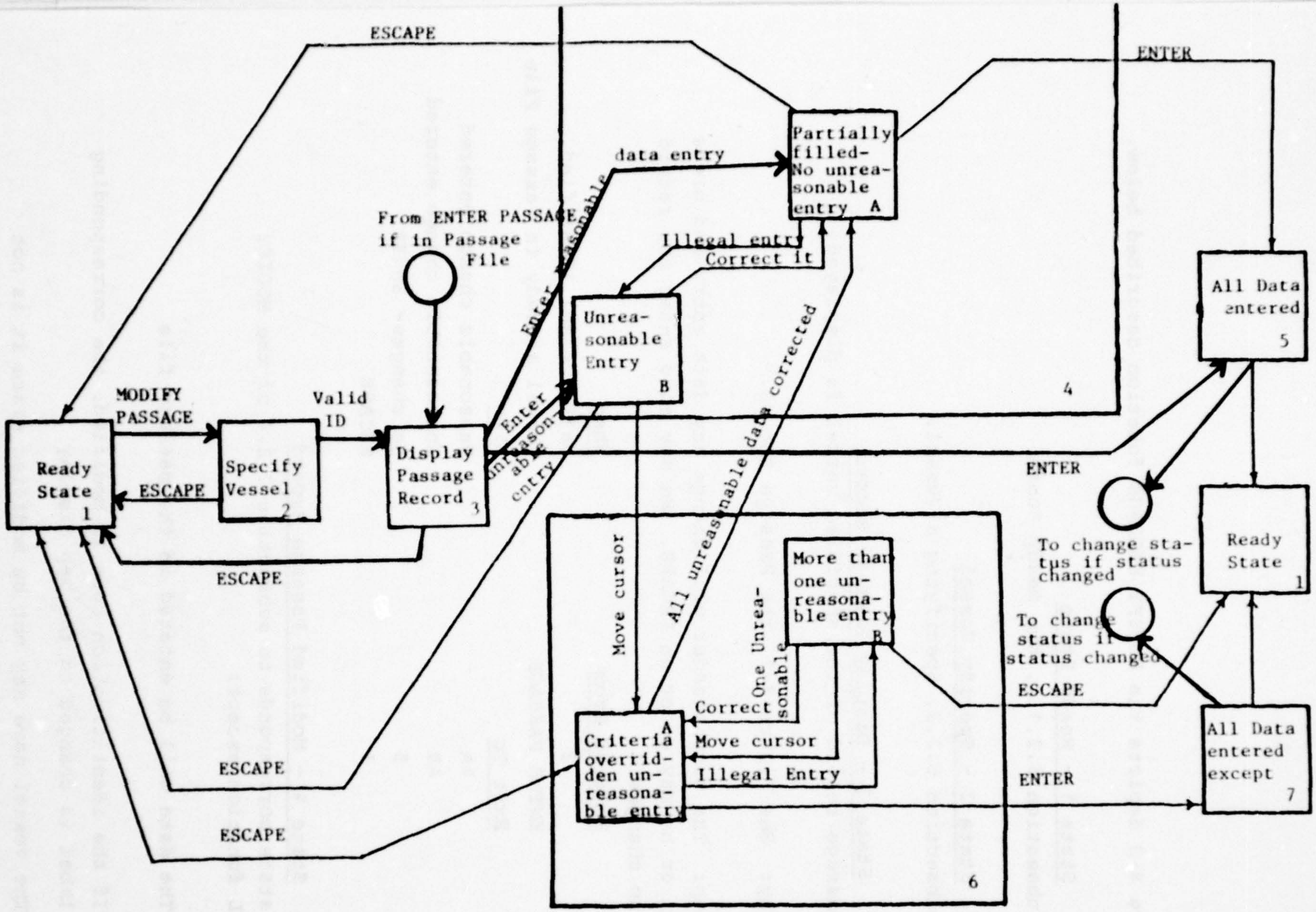


Figure 8-3. MODIFY PASSAGE

- If the status is changed, the function exits and enters the CHANGE STATUS function through 4 if new status is imminent, 5 if new status is underway, 6 if new status is anchored, or 7 if new status is docked after ENTER is pressed.

8.2.5 State 5 - All Data Has Been Entered

The watchstander is notified that all passage data for the specified vessel has been entered into the passage file.

Display:

```
All data for vessel ABC has been entered
  in the Passage File.
```

Actions: None

Entered From	When
3	ENTER pressed - No changes
4A	ENTER pressed

Exit To	When
1	Automatic
CHANGE STATUS	Status modified

8.2.6 State 6 - Modified Passage Record (One or more unreasonable entries)

This state corresponds subsection 7.2.6 of the MODIFY VESSEL function with the exceptions mentioned in state 4 of this function.

8.2.7 State 7 - All Data Entered Except

The system notifies the watchstander that all reasonable data for the vessel specified have been entered into the passage file and displays the unreasonable data excluded.

Display:

All data for vessel ABC has been entered in the Passage File except: ——

Actions: None

Entered From	When
6A	ENTER

Exit To	When
1	Automatic
CHANGE STATUS	Status modified

8.3 DELETE PASSAGE

The Delete Passage function allows the watchstander to delete a specified passage record from the passage file.

Figure 8-4 depicts the DELETE PASSAGE function described below.

8.3.1 State 1 - Ready State

See subsection 6.2.1.1, the Ready State.

8.3.2 State 2 - Specify Vessel

See subsection 6.2.2, Specifying a Vessel.

8.3.3 State 3 - Display Passage Record

This state corresponds to subsection 7.3.3 of the DELETE VESSEL function except that the passage record is displayed.

8.3.4 State 4 - Record Has Been Deleted

This state corresponds to subsection 7.3.4 of the DELETE VESSEL function except the passage record is deleted.

8.3.5 State 5 - Record May Not Be Deleted

This state corresponds to subsection 7.3.5 of the DELETE VESSEL function except the passage record may not be deleted.

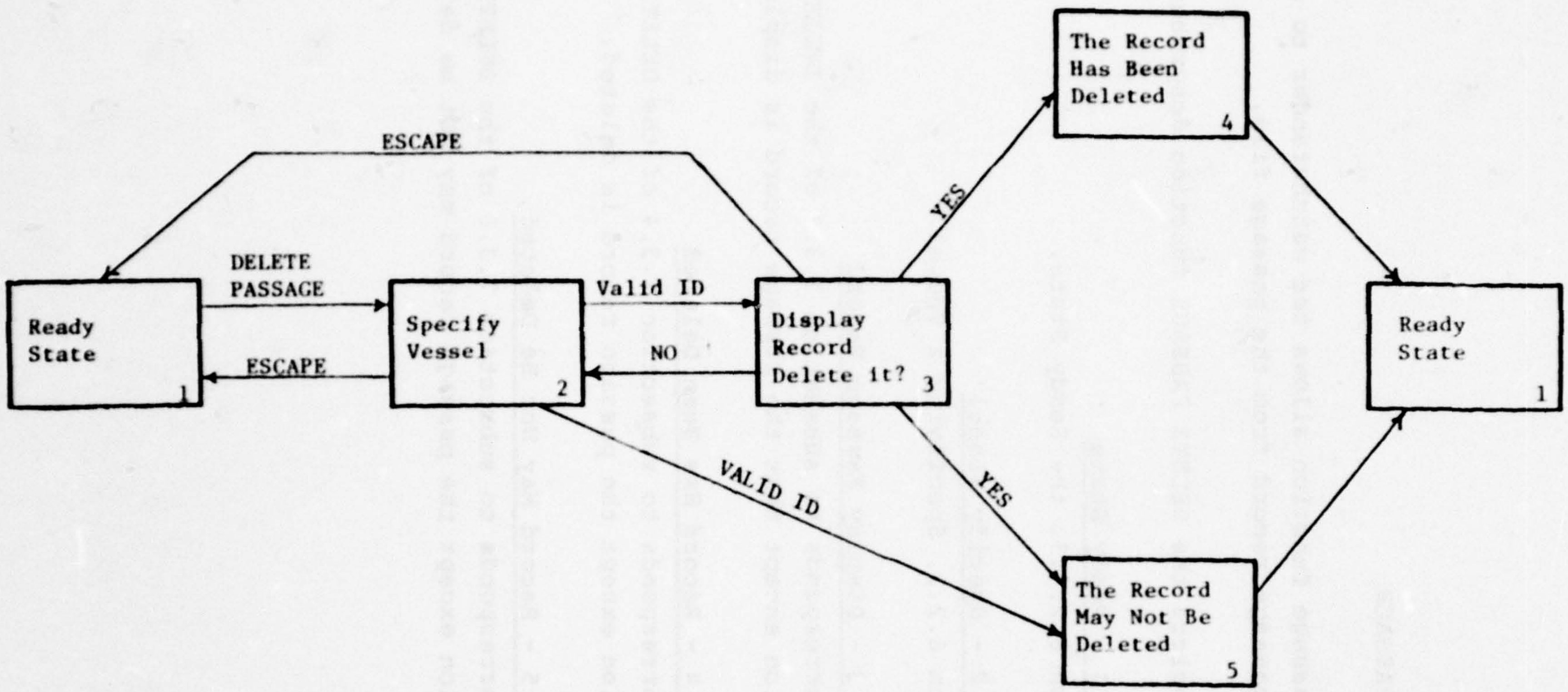


Figure 8-4. DELETE PASSAGE

8.4 DISPLAY PASSAGE

The Display Passage function allows the watchstander to display a passage record concerning a specified vessel from the passage file. The state diagram for the DISPLAY PASSAGE function is shown in Figure 8-5. The states of this function correspond to the DISPLAY VESSEL function (see Section 7.4) except that the passage record, rather than the vessel record, is displayed.

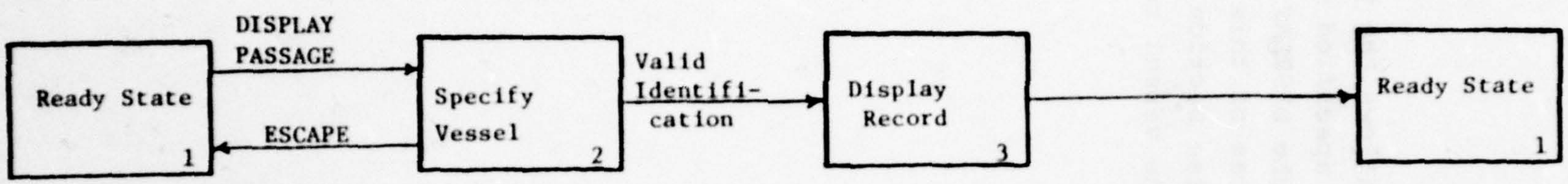


Figure 8-5. DISPLAY PASSAGE INFORMATION

8.5 UPDATE VESSEL POSITION

The Update Vessel Position function allows the watchstander to update the position system data concerning a designated vessel in the passage file.

In States 3, 4A, 4B, 4D and 4E of this function, the passage record specified is not locked out. Consequently, during these states another watchstander may be modifying, changing status, updating, or entering communication for this vessel in the passage file. (DELETE PASSAGE would not be legal.)
The information displayed on the Update Vessel Position form does not change as a result of other watchstander actions, but when the watchstander attempts to ENTER, he will be notified of any changes.

If the watchstander changes certain entries on the Update Vessel Position form, the system will automatically generate other changes. These entries and the automatic system changes are listed below:

a) Waypoint Designation -
Estimated time of arrival is computed using the distance from the newly designated waypoint to the next waypoint and the speed listed.

b) Date/Time at Waypoint -
Estimated time of arrival at next waypoint is adjusted using all other information listed.

c) Speed -
Estimated time of arrival is adjusted using new speed, distance between waypoints and the time at the waypoint.

d) Designation of Next Waypoint -
Estimated time of arrival is adjusted using speed, the distance between waypoints and the time at the waypoint. A ROUTE STRAY will be issued after the ENTER if this is not the same route as listed in the passage file.

e) Estimated Time of Arrival -
The speed entry will be recomputed using the distance between the waypoints and the time at waypoint and estimated time of arrival at next waypoint.

Figure 8-6 depicts the UPDATE VESSEL POSITION function described below.

8.5.1 <u>State 1 - Ready State</u>
See subsection 6.2.1.1, the Ready State

8.5.2 <u>State 2 - Specify Vessel</u>
See Subsection 6.2.2, Specifying a Vessel. If the vessel is not found in the passage file or if the identified vessel is not being tracked by radar, or is anchored or docked, the watchstander is notified that he must enter an ESCAPE or reidentify the vessel. Only vessels which are underway may be specified.

8.5.3 <u>State 3 - Display Update Vessel Position Form</u>
The following information from the passage file pertaining to the designated vessel is displayed.

1) Vessel identification code
2) Passage status
3) Last waypoint passed
4) Next waypoint
5) Estimated time of arrival at the next waypoint
6) Last communication

Items 4 and 5 are provided so the watchstander can compare passage file system data with the data he is currently reporting.

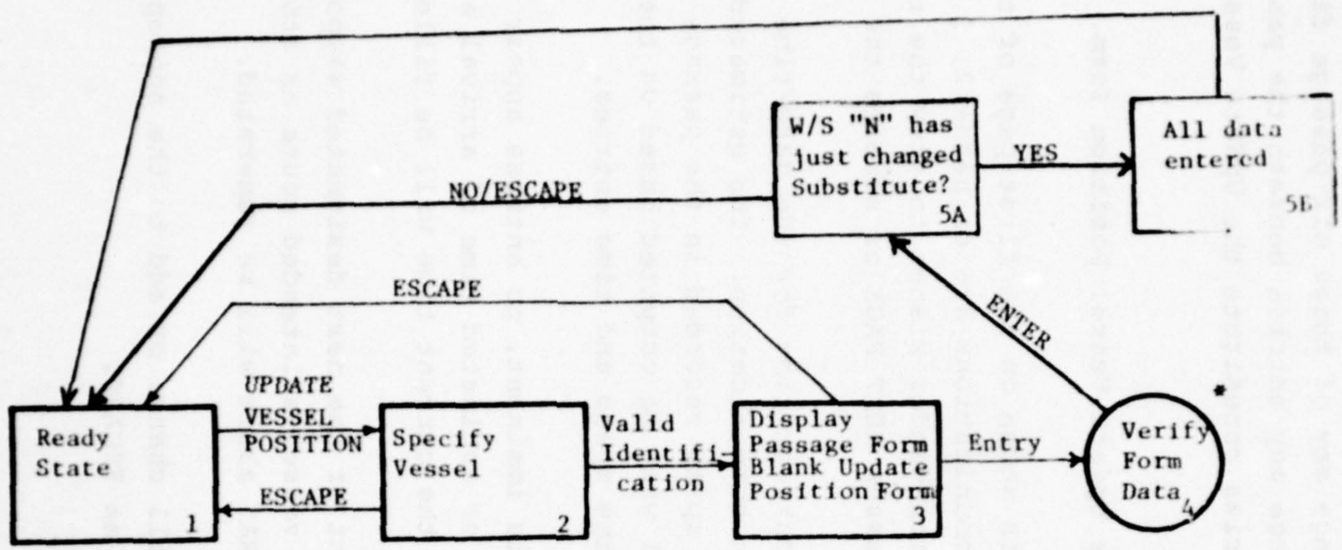


Figure 8-6. UPDATE VESSEL POSITION

* See state diagram in Section 6.2.4, Verifying Form Data

The watchstander may not change any of these six passage file entries; however, he may change any entries beneath the passage file information. These entries constitute the Update Vessel Position form.

Display: See Figure 8-7, the Update Vessel Position form.

Only the last communication is shown on the first page of the display. The rest of the communications are on pages 2, 3, and 4 of the display. If the watchstander wishes to view the rest of the communications, he presses NEXT PAGE or scrolls the display.

The system will fill in the current time for the date/time at waypoint and date/time of the communication. The estimated speed entry will be the last speed recorded in the passage file. The estimated time of arrival will be computed based on the vessels intended route, and the speed and time entries.

If the status of the vessel is imminent, no entries appear for last waypoint, next waypoint or estimated time of arrival at the top of the form and only the current time will be filled in.

If either the current waypoint or the next designated waypoint does not correspond with the vessel's intended route as stored in the passage file, a ROUTE STRAY alert will be generated.

Actions: The watchstander will change or add to the appropriate data fields, or he may enter an ESCAPE.

Update Vessel Position - vessel name

Identification Code: code

Status: underway

Last Waypoint Passed: T473

Next Waypoint: T478

Estimated Time of Arrival: Oct 12 13:48

Last Communication: Oct 12, 1978 12:02 ____________________

____________________.

Waypoint Designation:

-

Date/Time at Waypoint:

-Oct 12 13:25

Estimated Speed of Advance until Next Waypoint:

-speed

Designation of Next Waypoint:

Estimated Time of Arrival at Next Waypoint:

New Communication: Oct 12 13:45

Figure 8-7. Page 1 of Update Vessel Position Form

Entered From	When
2	Valid vessel identified

Exit To	When
4A	Reasonable data entered
4B	Unreasonable data entered
4C	ENTER - No changes
1	ESCAPE

8.5.4 State 4 - Verifying Form Data

See Subsection 6.2.4, Verifying Form Data. If another watchstander has modified since State 3 of this function, the system goes to State 5A after ENTER is pressed in State 4.

8.5.5 State 5 - Substitute Values

- Substate 5A

  If the data form is modified by another watchstander, changing the values displayed in State 3 of this function, the current values in the data base are displayed with the values just entered in parentheses. The watchstander must determine if he wants to substitute his copy.

Entered From	When
4C/4F	ENTER

Exit To	When
5B	YES
1	NO/ESCAPE

- Substate 5B

  The watchstander is notified that his values have been entered into the data base, replacing those entered by the other watchstander.

Entered From	When
5A	YES

Exit To	When
1	Automatic

8.6 ENTER NEW COMMUNICATION

The Enter New Communication function allows the watchstander to enter a new communication concerning a specified vessel into the passage file.

In States 3 and 4 of this function, the passage record specified is not locked out. Consequently, during these states another watchstander may be modifying, changing status, updating, or entering communication for this vessel in the passage file. (A DELETE PASSAGE would not be legal.) The information displayed on the Enter Communications form does not change as a result of other watchstander actions.

Figure 8-8 depicts the ENTER NEW COMMUNICATION function described below.

8.6.1 State 1 - Ready State

See Subsection 6.2.1.1, the Ready State.

8.6.2 State 2 - Specify Vessel

See Subsection 6.2.2, Specifying a Vessel.

8.6.3 State 3 - Display All Communications

The following information from the passage file pertaining to the designated vessel is displayed.

1) Vessel identification code
2) Vessel name
3) Passage status
4) Date/Time and content of all past communications.

The watchstander may not change any of these four entries. However, beneath this passage file information, the ENTER COMMUNICATION form appears.

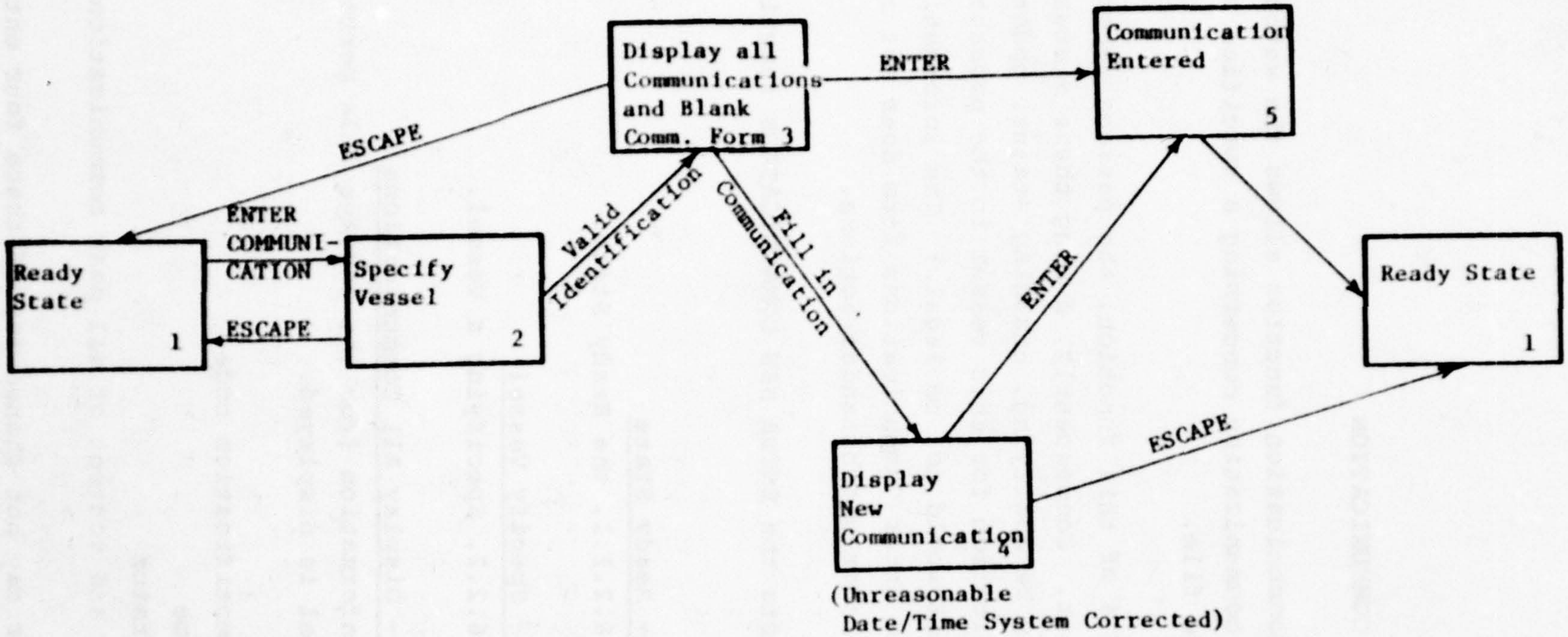


Figure 8-8. ENTER COMMUNICATION

Display: See Figure 8-9, the Enter Communications Display form.

The three most recent communications are on the first page. The watchstander may view the rest of the communications by scrolling. Only the bottom half of the page will scroll leaving the blank form for the new communication at the top of the page.

Actions: The system will automatically fill in the current date/time. (If the communication to be entered occurred at an earlier date/time, this entry may be changed.) The watchstander will fill in the content of the new communication, or he may enter an ESCAPE. If no new communication is to be entered, he will press ENTER.

Entered From	When
2	Valid vessel identified

Exit To	When
4	Communication entered - Unreasonable date/time
5	ENTER
1	ESCAPE

8.6.4 State 4 - Display New Communication (Unreasonable entry)

State 4 corresponds to State 3 of this function; however, if the watchstander has filled in an unreasonable entry for the date/time, the current value of the date/time will be entered. He may again change the current date/time in this state as long as it is a reasonable entry.

Entered From	When
3	Communication entered

Exit To	When
5	ENTER
1	ESCAPE

ENTER COMMUNICATION - vessel name

VESSEL IDENTIFICATION CODE: code

STATUS: status

NEW COMMUNICATION: current date/time

_

PREVIOUS COMMUNICATIONS:

date/time ____

____

__________.

date/time ____

____

__________.

date/time ____

____

__________.

Figure 8-9. ENTER COMMUNICATIONS Display Form

8.6.5 State 5 - Communication Entered

The watchstander is notified that the communication has been entered into the passage file for the vessel specified.

Display:

> Communication has been entered in the passage file for vessel name.

Entered From	When
3	ENTER
4	ENTER

Exit To	When
1	Automatic

8.7 IDENTIFY VESSEL

The Identify Vessel function allows the watchstander to identify a vessel which was automatically acquired and tracked by sensors (i.e., Level 4 or 5 systems), but not yet identified by name, to a vessel reference in the passage file.

If the system is tracking one vessel as two, this function may also be used to correct the situation (i.e., when the reported locations from different radars are not close enough that the system can, with 90% confidence, assume that they are the same vessel) by removing the duplicate vessel from the screen using the LINK key.

If a vessel being identified has been underway in a level 1, 2 or 3 sensor area, it will already appear on the map display at its dead reckoned position. It will be possible, then, to identify the passage file entry by hooking this symbol when the system requests the vessel identification. This is to be distinguished from the second use of the hook function to indicate the unidentified vessel as reported by Level 4 or 5 sensors. When the IDENTIFY VESSEL function is used to transfer a vessel from dead reckoning (Level 1, 2, or 3) to automatic tracking (Level 4 or 5), the original dead reckoned vessel symbol will be dropped from the display and its identity will transfer to the second vessel hooked (the tracked vessel). This action terminates further dead reckoning of this vessel until the vessel is outside the coverage area of the Level 4 or 5 sensors.

In States 3, 4A and 4B of this function, the passage record specified is not locked out. Consequently, during these states another watchstander may be modifying, changing status, updating, or entering communication for this vessel in the passage file. (DELETE PASSAGE would not be legal.) The information displayed on the Identify Vessel form does not change as a result of other watchstander actions.

Figure 8-10 depicts the IDENTIFY VESSEL function described below.

8.7.1 State 1 - Ready State

See Subsection 6.2.1.1, the Ready State.

8.7.2 State 2 - Specify Vessel

See Subsection 6.2.2, Specifying a Vessel. If the watchstander identifies a vessel in State 2A by hooking an unlabeled vessel, the system will go to Substate I even though there will be a tracker record for that vessel.

8.7.3 State 3 - Display Identify Vessel Form

If the vessel specified has been entered in the passage file, the Identify Vessel form appears on the display.

Display: See Figure 8-11, the Identify Vessel display form.

Actions: The watchstander will hook an unlabeled vessel, hook a tracked symbol with a label, hook a vessel symbol which is not in track, or he may enter an ESCAPE.

Entered From	When
2	Vessel specified has passage record
4A/4B/4C	CLEAR entered
PREVIOUS VESSEL	Chained from a function if vessel has passage record.

Exit To	When
4A	Unlabeled vessel hooked
4B	Tracked symbol with label hooked
4C	Vessel symbol not in track hooked
1	ESCAPE

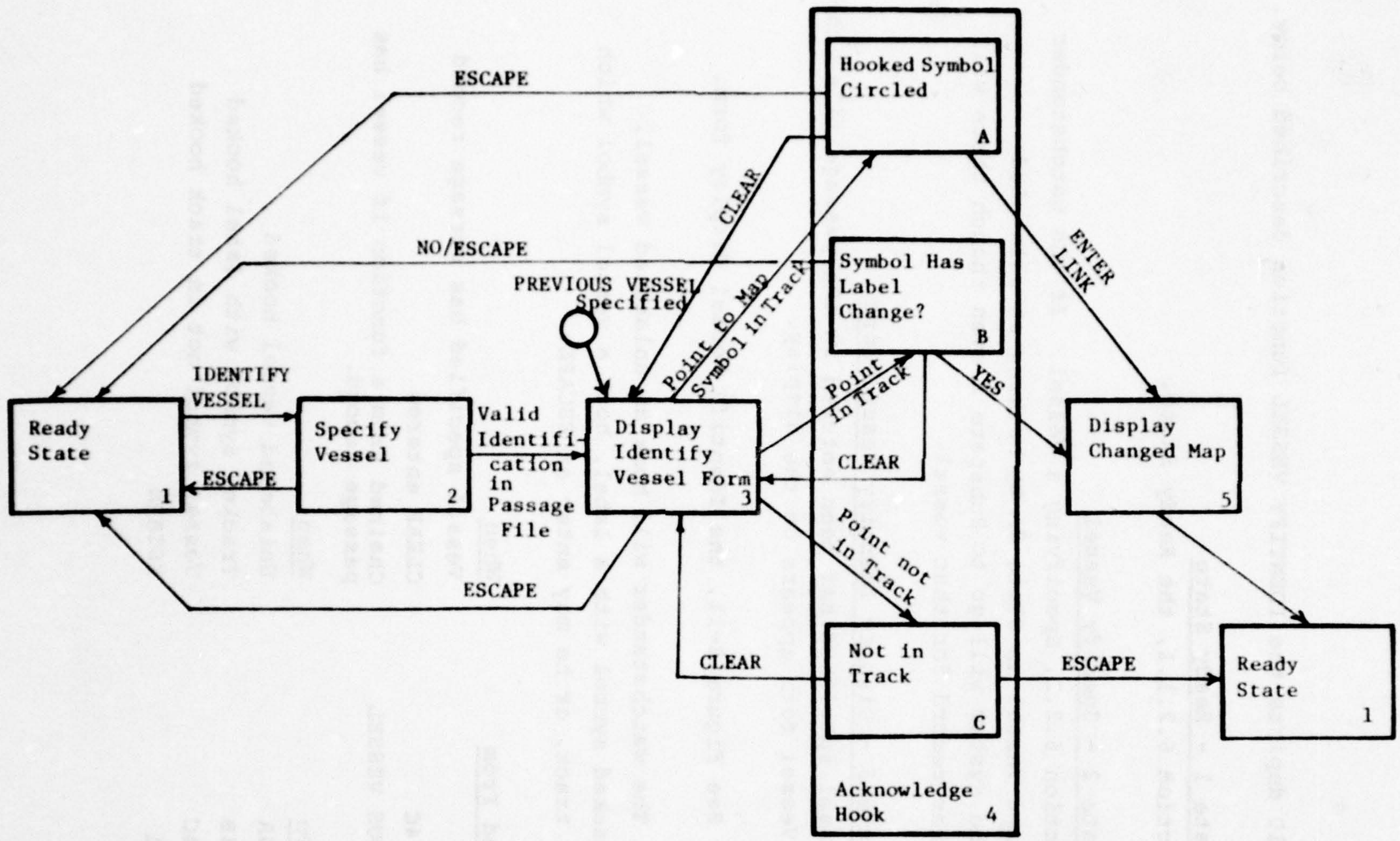


Figure 8-10. IDENTIFY VESSEL

Identify Vessel - vessel name

Vessel Identification Code:
code
Vessel Name:
name
Lloyds Registry or Military Hull Number:
number
Radio Call Sign:
sign
Type:
type
Gross Weight: (tons)
weight
Flag:
flag
Overall Length: (feet)
length

Hook vessel on the map.

Figure 8-11. IDENTIFY VESSEL Display Form

8.7.4 State 4 - Acknowledge Hook

- Substate 4A

  The unlabeled vessel symbol hooked appears circled on the map and the Identify Vessel display remains on the screen.

Display: See Figure 8-11, the Identify Vessel display form.

Actions: The watchstander will press CLEAR to cancel the hook action, LINK to remove a duplicate vessel in track from the screen, or ENTER to label the unidentified hooked vessel with its existing passage file identification. An ESCAPE may also be entered.

Entered From	When
3	Unlabeled vessel hooked

Exit To	When
3	CLEAR
5	ENTER or LINK
1	ESCAPE

- Substate 4B

  The watchstander is notified that the vessel symbol hooked already has a label and is asked if he wishes to relabel it.

Display:

Identify Vessel - vessel name the hooked vessel has already been identified as (vessel name now associated with label) Do you want to reidentify? (YES or NO) _

(The hooked vessel is circled on the map.)

Actions: The watchstander will press CLEAR to cancel the hook action, YES to relabel the hooked vessel, NO to retain the existing label, or he may enter an ESCAPE.

Entered From	When
3	Labeled vessel hooked

Exit To	When
3	CLEAR
1	NO or ESCAPE
5	YES

- Substate 4C

  The watchstander is notified that the vessel symbol hooked is not being tracked by radar.

Display:

Identify vessel - vessel name The hooked vessel is not in track

Actions: The watchstander will press CLEAR to cancel the hook action or he may enter an ESCAPE.

Entered From	When
3	Vessel hooked not in track

Exit To	When
3	CLEAR
1	ESCAPE

8.7.5 State 5 - Display Changed Map

A label from the passage file is attached to the unidentified vessel.

Display:

Status of vessel name is: underway Status of previous label is: imminent	The second sentence only appears if the hooked vessel was labeled before the function was invoked.

Actions: As a result of the hooked vessel's identification, the following changes on the map and in the passage file are possible:

1) The hooked vessel on the map will be labeled with the new ID code.

2) If the hooked vessel was previously labeled with another code, the status of the vessel will become imminent and the previous label will disappear from the display.

3) In the passage record for the identified vessel,

   . If the status was imminent, it will change to underway 4, 5 and the second page will contain the tracker information.

   . If the status was underway 1, 2, 3, the status will remain underway but the second page will contain the tracker information.

   . If the status was underway 4, 5, there already was a vessel (other than the hooked vessel) on the display with the ID code of this vessel. In this case, the label will be transferred from the existing vessel to the hooked vessel. The tracker information on page 2 of the record will also change to the information for the hooked vessel.

   . If the status was underway or docked, the label will be attached to the hooked vessel and removed from any other vessel on the display.

Entered From	When
4A	ENTER or LINK
4B	YES pressed

Exit To	When
1	Automatic

8.8 MODIFY CHECKPOINT

The Modify Checkpoint function allows the watchstander to modify and/or view up to 50 checkpoints concerning a designated vessel in the passage file.

In State 3, 4A, 4B, 4D and 4E of this function, the passage record specified is not locked out. Consequently, during these states another watchstander may be modifying, changing status, updating, or entering communication for this vessel in the passage file. (DELETE PASSAGE would not be legal.) The information displayed on the Modify Checkpoint form does not change as a result of other watchstander actions, but when the watchstander attempts to ENTER, he will be notified of any changes.

If the watchstander changes certain entries on the Modify Checkpoint form, the system will automatically generate other changes. These entries and the automatic system changes are described below:

a) Checkpoint Designation -
Estimated time of arrival is computed using the distance from the newly designated checkpoint to the next checkpoint and the speed listed.

b) Date/Time at Checkpoint -
Estimated time of arrival is computed based on the other information listed.

c) Speed -
Estimated time of arrival is computed using the new speed, distance between checkpoints and the time at the checkpoint.

d) Next Checkpoint -
Estimated time of arrival is computed using speed, the distance between checkpoints and the time at the checkpoint.

e) Estimated Time of Arrival -
Speed is computed using the distance between the checkpoints and the time at the checkpoint and the estimated time of arrival at the next checkpoint.

The map display will also be altered to reflect these changes.

Figure 8-12 depicts the MODIFY CHECKPOINT function described below.

8.8.1 State 1 - Ready State

See Subsection 6.2.1.1, the Ready State.

8.8.2 State 2 - Specify Vessel

See Subsection 6.2.2, Specifying a Vessel.

Only vessels that are underway may be specified. If the vessel is not underway, the watchstander is notified that he must enter an ESCAPE or reidentify the vessel.

8.8.3 State 3 - Display Modify Checkpoint Form

The Modify Checkpoint form for the designated vessel is displayed.

Display: See Figure 8-13, the Modify Checkpoint display form. (Up to 50 checkpoints passed by the designated vessel are shown.)

Actions: The watchstander will change any of the data entries on the Modify Checkpoint form, or he may enter an ESCAPE.

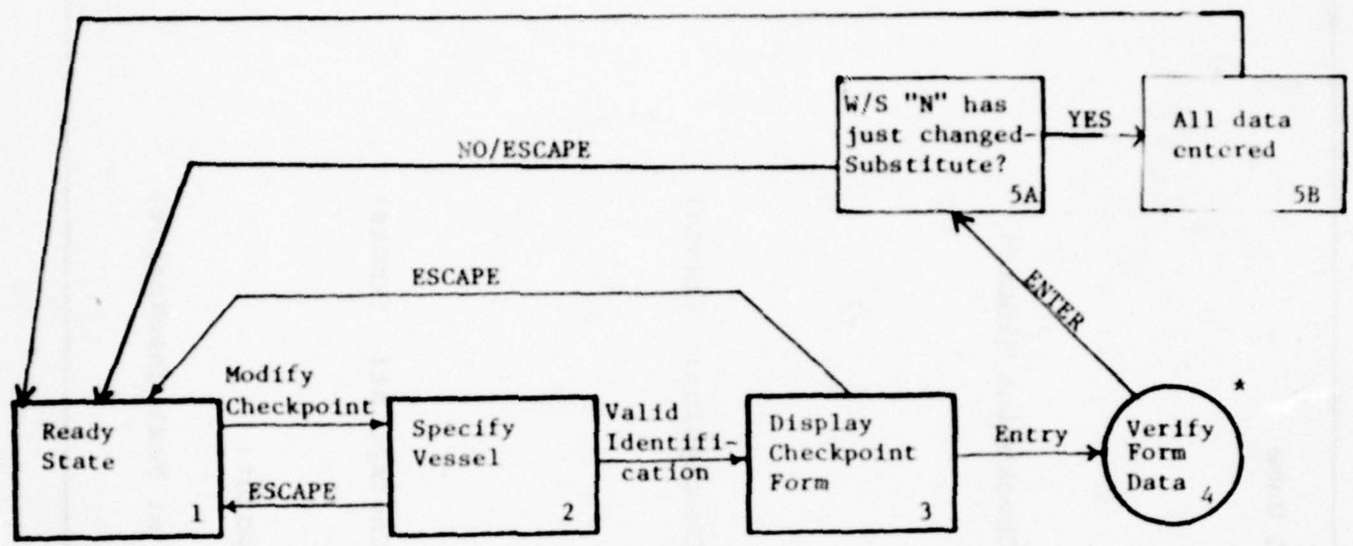


Figure 8-12. MODIFY CHECKPOINT

*See state diagram in Section 6,2.4, Verifying Form Data.

```
MODIFY CHECKPOINT - Vessel Name

Checkpoint Designation:
   T423
Date/Time at Checkpoint:
   10/23/78  9:48
Speed of Advance to Next Checkpoint (knots)
   10

Checkpoint Designation:
   B721
Date/Time at Checkpoint
   10/23/78  12:23
Speed of Advance to Next Checkpoint:  (knots)
   12

Checkpoint Designation:
   B722
Date/Time at Checkpoint:
   10/23/78  15:12
Speed of Advance to Next Checkpoint:  (knots)
   11

Designation of Next Checkpoint:

Estimated Time of Arrival at Next Checkpoint:
```

Figure 8-13. MODIFY CHECKPOINT Display Form

Entered From	When
2	Underway vessel found

Exit To	When
4A	Reasonable data entered
4B	Unreasonable data entered
4C	ENTER - No changes
1	ESCAPE

8.8.4 State 4 - Verifying Form Data

See subsection 6.2.4, Verifying Form Data. If another watchstander has modified since State 3 of this function, the system goes to State 5A after ENTER is pressed in State 4.

8.8.5 State 5 - Substitute Values

See Section 8.5.5 of the Update Vessel Position function.

8.9 CHANGE STATUS

The Change Status function allows the watchstander to change the status of a designated vessel in the passage file.

In states 3,4,5,6 and 7 of this function, the passage data specified is not locked out. Consequently, during these states another watchstander may be modifying, changing status, updating, or entering communication for this vessel in the passage file. (DELETE PASSAGE would not be legal). The information displayed on the Change Status form does not change as a result of other watchstander actions, but when the watchstander attempts to ENTER, he will be notified of any changes.

If the watchstander changes an entry on the Change Status form, the system will automatically generate other changes. These entries and the automatic system changes are listed below:

- From imminent to underway - Requests the watchstander to either identify the vessel on the map display (if the vessel is within the coverage area of level 4 or 5 sensors), or enter the following information:

  - Designation of next waypoint

  - Average speed of advance to next waypoint, or the estimated time of arrival at the next checkpoint (The system will calculate and enter the value the watchstander chose not to enter.)

- From underway to imminent - Transfers the passage data to the vessel passage history and traffic summary files. All waypoint information will then be deleted from the passage file for that vessel.

- From underway to anchored or docked - First invokes the underway to imminent functions described above, then displays a blank form requesting entry of the following information:

  - Anchorage designation (if it is a standard predefined anchorage point)

  - Swing radius of the mooring

  - Location of anchorage (if it is a non-standard anchorage) in latitude and longitude or described in English using references to nearby landmarks. If there is a map display, the position may also be identified using the map cursor.

  - Date/time anchorage was established (This entry will automatically contain the current date/time which may be changed by the watchstander if this was a delayed report.)

  - Date/time expected to get underway.

- From anchored or docked to underway - Records the anchorage information into the vessel passage history file, deletes the anchorage information from the passage file data, and then invokes the functions for the imminent to underway status change described above.

- From imminent to anchored or docked - Provides the same functions as the status change from underway to anchored or docked except that the underway to imminent functions are not involved.

- From anchored or docked to imminent - Records the anchorage information into the vessel passage history file then deletes the anchorage information from the passage file.

Figure 8-14 depicts the CHANGE STATUS function described below.

8.9.1 State 1 - Ready State

See subsection 6.2.1.1, the Ready State.

8.9.2 State 2 - Specify a Vessel

See subsection 6.2.2, Specifying a Vessel.

8.9.3 State 3 - Display Change Status Form

- Substate 3A

  The Change Status form for the designated vessel in the passage file is displayed.

Display: See Figure 8-15, the Change Status display form.

Actions: The watchstander will fill in the status list entry number desired, or he may enter an ESCAPE.

Entered From	When
2	Valid vessel identified in passage file

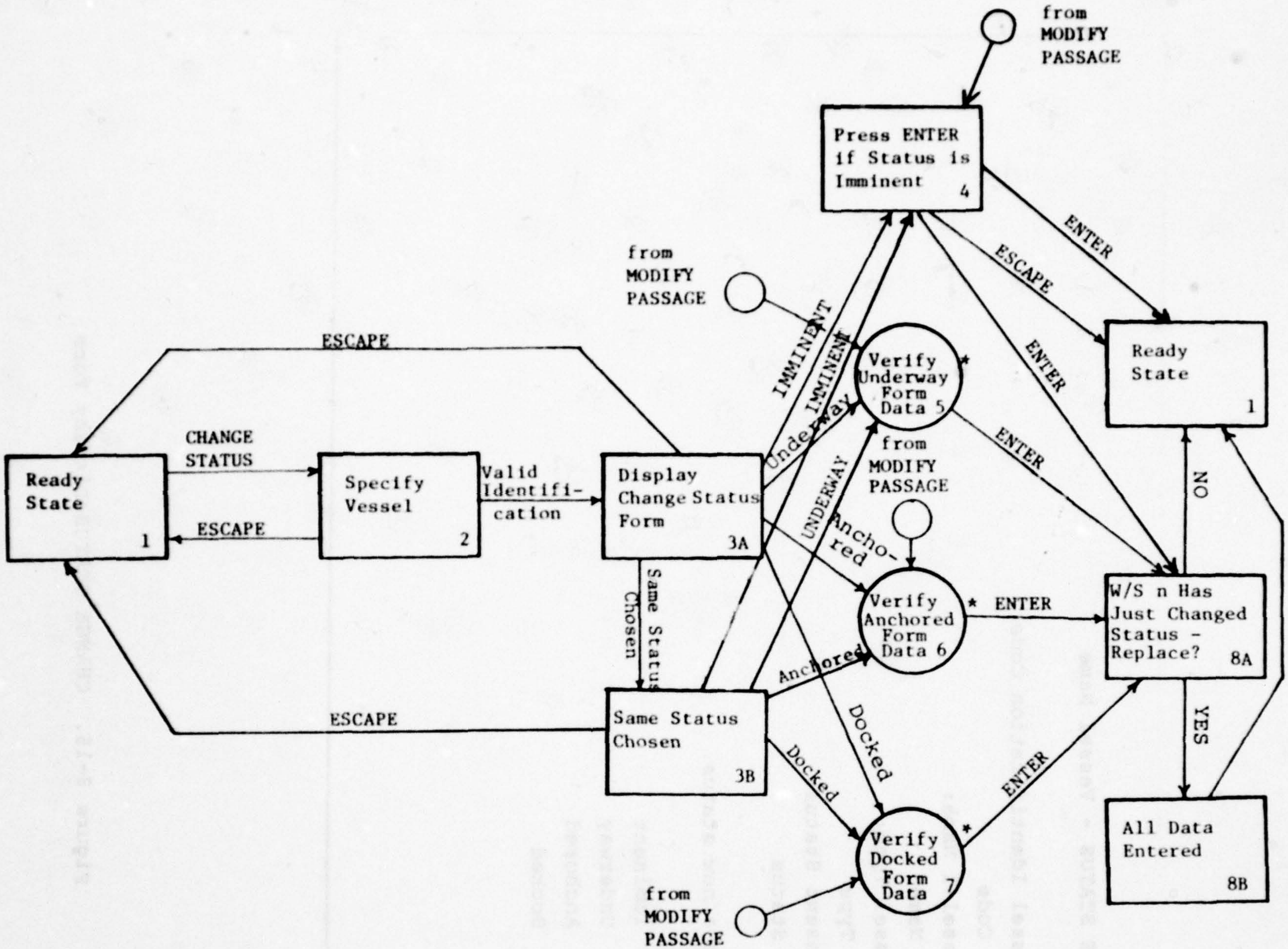


Figure 8-14. CHANGE STATUS

* See state diagram in Section 6.2.4, Verifying Form Data

CHANGE STATUS - Vessel Name

Vessel Identification Code:
Code
Vessel 1 Name:
Name
Vessel Type:
Type
Present Status:
Status

Choose a new status.

1. Imminent
2. Underway
3. Anchored
4. Docked

Figure 8-15. CHANGE STATUS Display Form

Exit To	When
3B	Same status chosen
4	Imminent status chosen
5A	Underway status chosen
6A	Anchored status chosen
7A	Docked status chosen
1	ESCAPE

- Substate 3B

  The Change Status form for the designated vessel is displayed with notification that the status chosen is the same as the former status.

Display: The display will be the same as the display for State 3A except that the status chosen by the W/S will be displayed and an error message will be to the right. The cursor will be at the beginning of the entry.

3 Same Status

Actions: The watchstander will fill in a new status list entry number, or he may enter an ESCAPE.

Entered From	When
3A	Same status chosen

Exit To	When
4	Imminent
5A	Underway
6A	Anchored
7A	Docked
1	ESCAPE

8.9.4 State 4 - New Status is Imminent

The watchstander is notified that the designated vessel's status will be changed to imminent.

Display:

```
CHANGE STATUS - vessel name

Press ENTER to complete the change of
status to imminent
```

Actions: The watchstander will press ENTER, or he may enter an ESCAPE. If another watchstander has changed the status prior to this state, the system enters state 8A and no change is made in the passage record or the vessel passage history file.

Entered From	When
3A	Entry number 3 selected
3B	Entry number 3 selected
MODIFY PASSAGE	Status changed to imminent

Exit To	When
8A	Another status change entered
1	ENTER or ESCAPE

8.9.5 State 5 - New Status is Underway

The following states correspond to subsection 6.2.4, Verifying Form Data.

- Substate 5A

  The watchstander is notified that the designated vessel's status will be changed to underway after either the vessel is hooked or the requested data is entered.

Display:

```
Change Status - Vessel Name
Hook vessel on display or fill in the following:
Designation of next waypoint:
_
Average Speed of advance to next waypoint:
Estimated time of arrival:
```

Actions: The watchstander will hook the vessel symbol desired or fill in the next waypoint, average speed, and time of arrival, and then press ENTER. He may also enter an ESCAPE. If a hooked vessel is not in track, the system will flash VESSEL NOT IN TRACK. If an unreasonable response is entered, it will flash to notify the watchstander of error. If another watchstander has changed the vessel's status since state 3 of this function, the system goes to 8A when ENTER is pressed to ensure that the watchstander wants to replace the new status with his own.

Entered From	When
3A/3B	Underway chosen
MODIFY PASSAGE	Status change in MODIFY PASSAGE
5B	Unreasonable entry corrected
5D	All unreasonable entry corrected

Exit To	When
5C	ENTER
5B	Unreasonable entry
1	ESCAPE
8A	ENTER-Another status change entered

- Substate 5B

  If an unreasonable response is entered in state 5A, it is flashed on the display to alert the watchstander and the hook instruction is deleted.

Display: See substate 5A display.

Actions: The watchstander will correct the unreasonable entry and press ENTER, move the cursor to override the reasonabiltiy criteria or enter an ESCAPE. The system will compute a new value for time or speed based on the other correct entries.

Entered From	When
5A	Unreasonable entry

Exit To	When
5A	Reasonable entry corrected
5D	Reasonability criteria overridden
1	ESCAPE

* <u>Substate 5C</u>

  The watchstander is notified that the status change for the vessel designated has been entered into the system.

Display:

All status information entered for (Vessel Name).

Actions: The system will add the appropriate information to the history and/or passage file(s).

<u>Entered From</u>	<u>When</u>
5A	ENTER

<u>Exit To</u>	<u>When</u>
1	Automatic

* <u>Substate 5D</u>

  If the watchstander overrides a flashing unreasonable entry by moving the cursor, the status form remains displayed for further verification with the erroneous entry or entries now indicated by an asterisk.

Display: See substate 5A display.

Actions: The watchstander will add to or change any entry on the form, possibly enter another unreasonable response, or he may enter an ESCAPE. If another watchstander has changed the vessel's status since state 3 of this function, the system goes to 8A when ENTER is pressed to ensure that the watchstander wants to replace the new status with his own.

Entered From	When
5B	Reasonability criteria overridden
5E	One unreasonable entry corrected or cursor moved

Exit To	When
5A	All unreasonable entries corrected
5E	Unreasonable entry
5F	ENTER -Unreasonable data
1	ESCAPE
8A	ENTER-Another status change entered

Note: The system may spontaneously revert to 5A if the Watch Supervisor alters the reasonability criteria.

- Substate 5E
  If another unreasonable response is entered, the most recent unreasonable entry will flash on the display to alert the watchstander.

Display: See substate 5A display.

Actions: The watchstander will change the flashing data entry, possibly enter another unreasonable response, move the cursor, or he may enter an ESCAPE. If the change to the flashing entry is another unreasonable entry, the entry will remain flashing until corrected or an ESCAPE is entered. Entering a reasonable value may cause an automatic change in another entry. If that entry was unreasonable, it will now be corrected by the system.

Entered From	When
5D	Unreasonable data entered

Exit To	When
5D	One unreasonable entry corrected or cursor moved
1	ESCAPE

● Substate 5F

The system notifies the watchstander that all reasonable status data for the vessel specified have been entered into the system and displays the unreasonable data excluded.

Display:

```
All status information entered for (Vessel Name) except:
        1.
        2.
        .
        .
Supervisor has been notified.
```

Actions: The system will add the appropriate reasonable information to the history and/or passage file. If the system can compute a reasonable entry, that entry is substituted.

Entered From	When
5D	ENTER

Exit To	When
1	Automatic

8.9.6 State 6 - New Status is Anchored

This state corresponds to state 5 of this function except that the system enters 6A by choosing anchored (i.e., status list entry 3) in state 3A or 3B or by changing the status to anchored during MODIFY PASSAGE.

Display:

```
Change Status - Vessel Name
Anchorage Designation:
_
Swing Radius
Location of Anchorage:
Date/Time Established:
Current date/time
Date/Time Expected tc Get Underway
```

W/S may use the SET function to enter the LAT/LON for location of anchorage.

8.9.7 State 7 - New Status is Docked

This state corresponds to state 6 of this function except that the system enters 7A by choosing docked (i.e., status list entry 4) in state 3A or 3B, or by changing the status to docked during MODIFY PASSAGE.

Display:

Change Status - Vessel Name
Dock or Pier Designation
_
Date/Time Arrived:
Current Time
Date/Time of Scheduled Departure:

8.9.8 State 8 - Enter New Status Values

- Substate 8A

  If the vessel's status changes from the value designated while in state 3 of this function (or state 3 of the MODIFY PASSAGE function), the current status values are displayed with the status values just entered by the watchstander in parentheses. The watchstander must determine if he wants to substitute his copy.

Display:

W/S (n) has just changed status to imminent, underway ...	
Do you want to substitute your Values?	
Anchorage Designation	
other value	values enter by W/S
.	
.	
.	
.	

Actions: The watchstander will press YES or NO, or he may enter an ESCAPE.

Entered From	When
4, 5A, 6A, 7A 5D, 6D, 7D	ENTER

Exit To	When
8B	YES
1	NO pressed
1	ESCAPE

- Substate 8B

The watchstander is notified that his status change for the vessel designated has been entered into the system.

Display:

```
All status information entered for (Vessel Name).
```

Actions: The system will add the appropriate information to the history and/or passage file(s).

Entered From	When
8A	YES

Exit To	When
1	Automatic

9 WATERWAY CHARACTERISTICS FILE FUNCTIONS

The waterway characteristics file functions included in this chapter provide the capabilities to enter, modify, delete and display route segment or cell system data.

9.1 ROUTE SEGMENT FUNCTIONS

The following route segment functions permit the watchstander to enter, modify, delete or display route segment system data.

9.1.1 Enter Route Segment

The Enter Route Segment function allows the watchstander to enter system data concerning a waterway route segment by specifying the segment name, the end points defining the subsegments (straight line segments), and other pertinent information.

Figure 9-1 depicts the ENTER ROUTE SEGMENT function described below.

9.1.1.1 State 1 - Ready State

See Subsection 6.2.1.1, the Ready State.

9.1.1.2 State 2 - Enter Route Segment Data

The watchstander must enter pertinent data to define the route segment.

Display:

```
ENTER ROUTE SEGMENT
Enter Route Segment Data
Segment Designation:_
Special or Normal Segment?:
Minimum Depth at MLLW (Feet):
Speed Limit (Knots):
Minimum Width of Normal Segment (Feet):
```

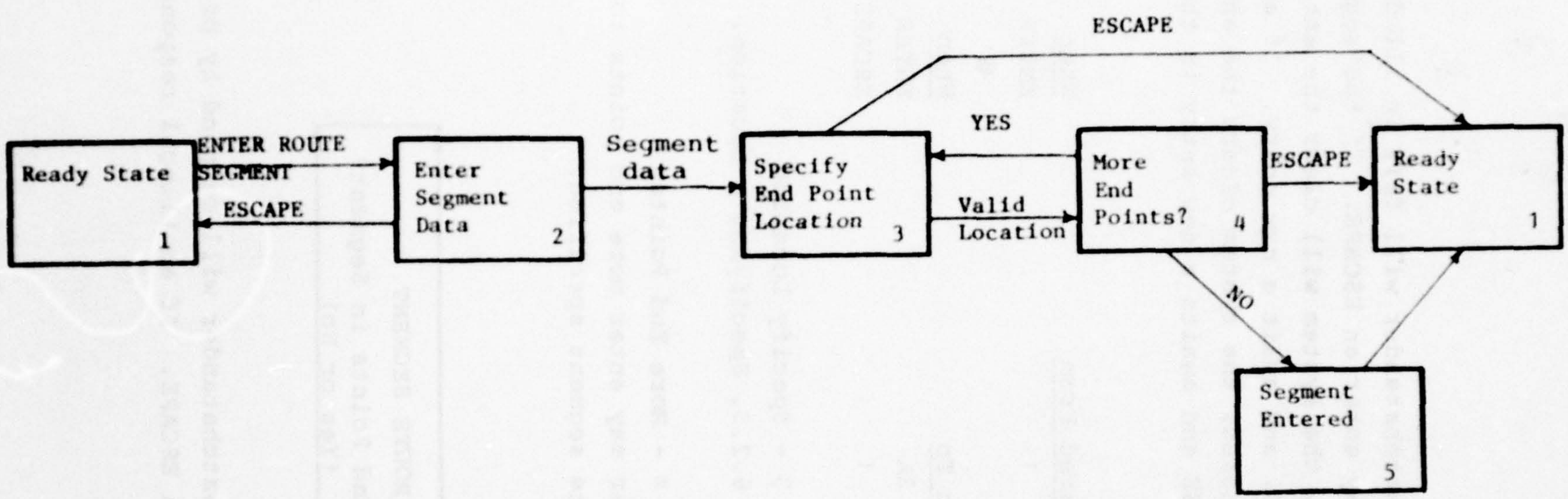


Figure 9-1. Enter Route Segment

Actions: The watchstander will fill in all data fields and press ENTER, or he may enter an ESCAPE. If the segment designation already exists, the system will clear the entry, display SEGMENT ALREADY DEFINED, and await a new entry. If any other illegal response is entered, the system clears the entry, displays INVALID RESPONSE and awaits a new entry in the input field in error.

Entered From	When
1	ENTER ROUTE SEGMENT pressed

Exit To	When
3A	ENTER pressed
1	ESCAPE

9.1.1.3 State 3 - Specify Location
See Subsection 6.2.3, Specifying a Location.

9.1.1.4 State 4 - More End Points?
The watchstander may enter more end points to define subsegments within the route segment specified.

Display:

```
ENTER ROUTE SEGMENT
More End Points in Segment?
        (Yes or No)
```

Actions: The watchstander will respond by pressing YES or NO, or he may enter an ESCAPE. If an illegal response is entered, the system

will clear the entry, display INVALID RESPONSE and await a new entry. MAXIMUM ENDPOINTS will be displayed when the maximum number (predetermined by the Watch Supervisor) have already been entered.

Entered From	When
3E	NO pressed
3F	Valid range and bearing values entered

Exit To	When
3A	YES pressed
5	NO pressed
1	ESCAPE

9.1.1.5 State 5 - Segment Entered

The watchstander is notified that the route segment system data has been entered.

Display:

```
ENTER ROUTE SEGMENT
Segment Entered
```

Actions: None

Entered From	When
4	NO pressed

Exit To	When
1	Automatic

9.1.2 Modify Route Segment

The Modify Route Segment function allows the watchstander to modify system data concerning a specified waterway route segment.

Figure 9-2 depicts the MODIFY ROUTE SEGMENT function described below.

9.1.2.1 State 1 - Ready State

See subsection 6.2.1.1, the Ready State.

9.1.2.2 State 2 - Enter Route Segment Designation

The watchstander must enter the route segment designation desired.

Display:

```
MODIFY ROUTE SEGMENT
Enter Route Segment Designation:
_
```

Actions: The watchstander will type the desired route segment designation and press ENTER, or he may enter an ESCAPE. If the segment designation does not exist, the system will clear the entry, display SEGMENT NOT DEFINED and await a new entry. If any other illegal response is entered, the system will clear the entry, display INVALID RESPONSE and await a new entry.

Entered From	When
1	MODIFY ROUTE SEGMENT pressed

Exit To	When
3	Valid route segment designation entered
1	ESCAPE

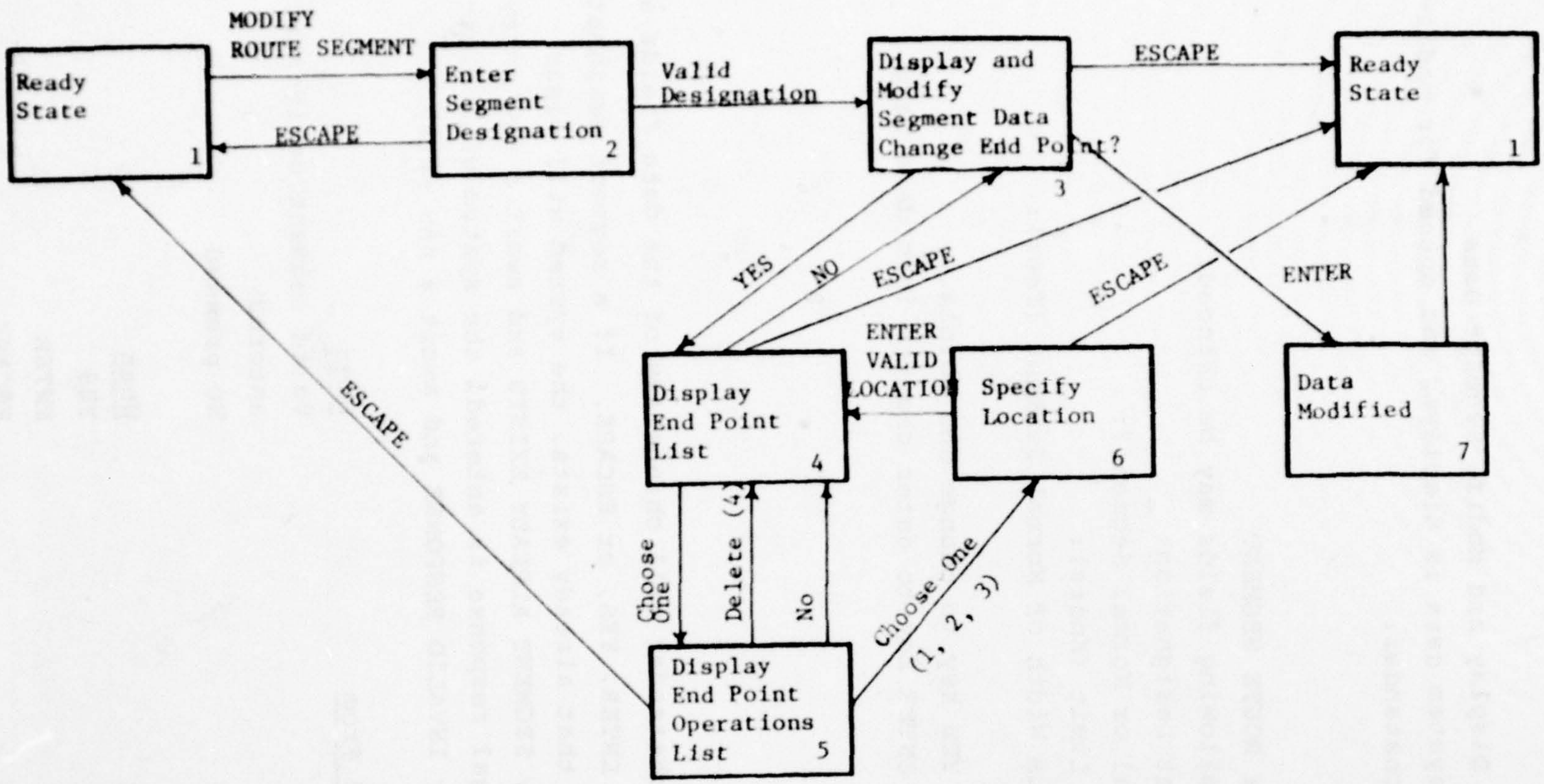


Figure 9-2. Modify Route Segment

9.1.2.3 State 3 - Display and Modify Segment Data

The route segment system data is displayed and opened for modification by the watchstander.

Display:

```
MODIFY ROUTE SEGMENT
The following fields may be changed:
Segment Designation: _
Special or Normal Segment?:
Speed Limit (Knots):
Minimum Width of Normal Segment (Feet):

Press YES key to change end points.
Press ENTER key to enter changes into data base.
```

Actions: The watchstander will change any of the data fields and then press either ENTER, YES, or ESCAPE. If a segment designation is changed to one that already exists, the system will clear the entry, display SEGMENT ALREADY EXISTS and await a new entry. If any other illegal response is entered, the system will clear the entry, display INVALID RESPONSE and await a new entry.

Entered From	When
2	Valid segment designation entered
4	NO pressed

Exit To	When
4	YES
7	ENTER
1	ESCAPE

9.1.2.4 State 4 - Display End Point List

The end point list of the designated route segment is displayed.

Display:

```
MODIFY ROUTE SEGMENT
Choose one of the following end points
or press NO key if no changes:
     LATITUDE            LONGITUDE
1.   dd°mm'ss'           ddd°mm'ss"
2.      .                    .
        .                    .
        .                    .
        .                    .
n.      .                    .
_
```

Actions: The watchstander will type the end point list entry number desired, press NO if no change is required, or ESCAPE. If an illegal response is entered, the system will clear the entry, display INVALID RESPONSE and await a new entry.

Entered From	When
3	YES pressed
6E	NO pressed
6F	Valid range and bearing entered
5	Delete operation selected or NO pressed

Exit To	When
5	Valid entry number entered
3	NO pressed
1	ESCAPE

9.1.2.5 State 5 - Display End Point Operations List

The end point operations list is displayed and the watchstander must designate the type of operation to be performed.

Display:

```
MODIFY ROUTE SEGMENT
Choose one of the following end point operations
on the selected endpoint:
1. Replace
2. Insert Before
3. Insert After
4. Delete

_
Press NO key if no operation is to be done.
```

Actions: The watchstander will type the operations list entry number desired, press NO if no operation is required, or ESCAPE. If operation list entry number 4 (delete) is selected, the system will return to State 4 and display the end point list with the end point specified deleted. If an illegal response is entered, the system will clear the entry, display INVALID RESPONSE and await a new entry.

Entered From	When
4	End point list entry number entered

Exit To	When
6A	Operation entry number 1,2, or 3 selected
1	ESCAPE
4	NO pressed or entry number 4 selected

9.1.2.6 State 6 - Specify Location of End Point

See Subsection 6.2.3, Specifying a Location.

Entered From	When
5	Operation list entry number 1, 2, or 3 selected

Exit To	Where
4	Valid location specified
1	ESCAPE

9.1.2.7 State 7 - All Data Entered

The watchstander is notified that the designated route segment system data has been modified.

Display:

```
MODIFY ROUTE SEGMENT

Segment has been modified.
```

Actions: None

Entered From	When
3	ENTER

Exit To	When
1	Automatic

9.1.3 Delete Route Segment

The Delete Route Segment function allows the watchstander to delete system data concerning a designated route segment.

Figure 9-3 depicts the DELETE ROUTE SEGMENT function described below.

9.1.3.1 State 1 - Ready State

See subsection 6.2.1.1, the Ready State.

9.1.3.2 State 2 - Enter Route Segment Designation

The watchstander must enter the route segment designation desired.

Display:

```
DELETE ROUTE SEGMENT
Enter Route Segment Designation:

_
```

Actions: The watchstander will fill in the route segment designation and press ENTER, or he may enter an ESCAPE. If the segment designation does not exist, the system will clear the entry, display SEGMENT NOT DEFINED and await a new entry. If any other illegal response is entered, the system will clear the entry, display INVALID RESPONSE, and await a new entry.

Entered From	When
1	DELETE ROUTE SEGMENT pressed

Exit To	When
3	Valid designation entered
1	ESCAPE

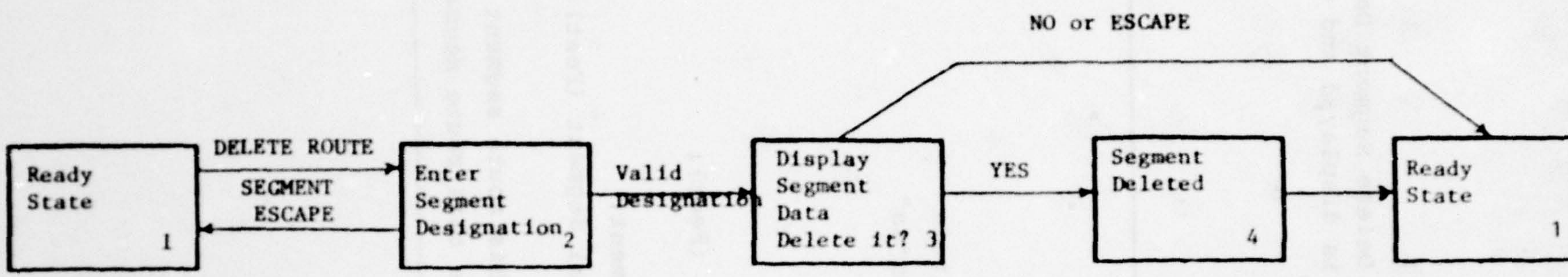


Figure 9-3. Delete Route Segment

9.1.3.3 State 3 - Display and Delete Segment Data

The route segment system data is displayed and opened for deletion by the watchstander.

Display:

```
DELETE ROUTE SEGMENT
Route Segment Data
Segment Designation:
End Point Coordinates
     Latitude            Longitude
     dd°mm'ss"           ddd°mm'ss"          This screen
         .                   .               area may be
         .                   .               rolled up or
         .                   .               down to display
                                             all end points.
     Length (Feet):
     Minimum Depth at MLLW (Feet):
     Speed Limit (Knots):
     Special or Normal Segment:
     Minimum Width of Normal Segment (Feet):

     Press YES to delete this route segment
     Press NO to not delete this route segment
```

Actions: The watchstander will press YES to delete the route segment or NO to retain the route segment, or he may enter an ESCAPE. If an illegal response is entered, the system will display INVALID RESPONSE and await a new entry.

Entered From	When
2	Valid segment designation entered

Exit To	When
4	YES pressed
1	NO or ESCAPE pressed

9.1.3.4 State 4 - Segment Deleted

The watchstander is notified that the designated route segment system data has been deleted.

Display:

```
DELETE ROUTE SEGMENT
Segment has been deleted
```

Actions: None

Entered From	When
3	YES pressed

Exit To	When
1	Automatic

9.1.4 Display Route Segment

The Display Route Segment function allows the watchstander to display system data concerning a designated route segment.

Figure 9-4 depicts the DISPLAY ROUTE SEGMENT function described below.

9.1.4.1 State 1 - Ready State

See subsection 6.2.1.1, the Ready State.

9.1.4.2 State 2 - Enter Segment Designation

The watchstander must enter the route segment designation desired.

Display:

```
DISPLAY ROUTE SEGMENT
Enter Route Segment Designation:
-
```

Actions: The watchstander will fill in the route segment designation and press ENTER, or he may enter an ESCAPE. If the segment designation does not exist, the system will clear the entry, display SEGMENT NOT DEFINED, and await a new entry. If any other illegal response is entered, the system will clear the entry, display INVALID RESPONSE, and await a new entry.

Entered From	When
1	DISPLAY ROUTE SEGMENT

Exit To	When
3	ENTER
1	ESCAPE

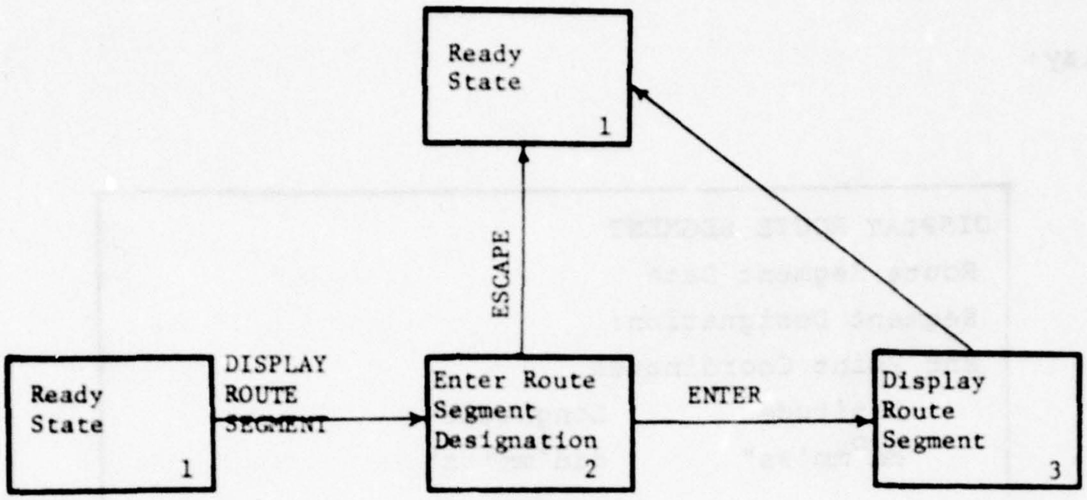


Figure 9-4. Display Route Segment

9.1.4.3 State 3 - Display Route Segment Data

The system data for the waterway route segment specified is displayed.

Display:

```
DISPLAY ROUTE SEGMENT
 Route Segment Data
 Segment Designation:
 End Point Coordinates
      Latitude            Longitude
      dd°mm'ss"           ddd°mm'ss"
         .                   .
         .                   .
         .                   .
      Length (Feet):
      Minimum Depth at MLLW (Feet):
      Speed Limit (Knots):
      Special or Normal Segment:
      Minimum Width of Normal Segment (Feet):
```

Actions: None

Entered From	When
2	ENTER

Exit To	When
1	Automatic

9.2 WATERWAY CELL FUNCTIONS

The following waterway cell functions permit the watchstander to enter, modify, delete or display cell system data.

9.2.1 Enter Cell

The Enter Cell function allows the watchstander to enter system data concerning a specified waterway cell.

Figure 9-5 depicts the ENTER CELL function described below.

9.2.1.1 State 1 - Ready State

See subsection 6.2.1.1, the Ready State.

9.2.1.2 State 2 - Specify Location

See subsection 6.2.3, Specifying a Location.

9.2.1.3 State 3 - Cell Record Already Exists

The watchstander is notified that the cell record already exists.

Display:

```
ENTER CELL
Cell Record Already Exists
```

Actions: None

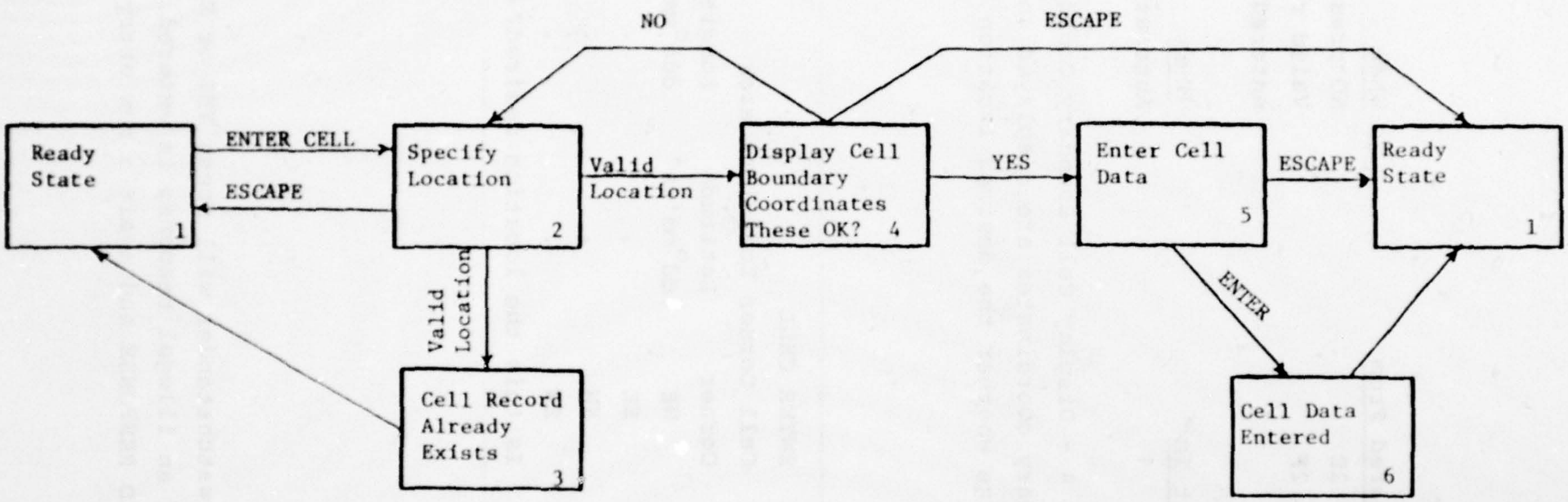
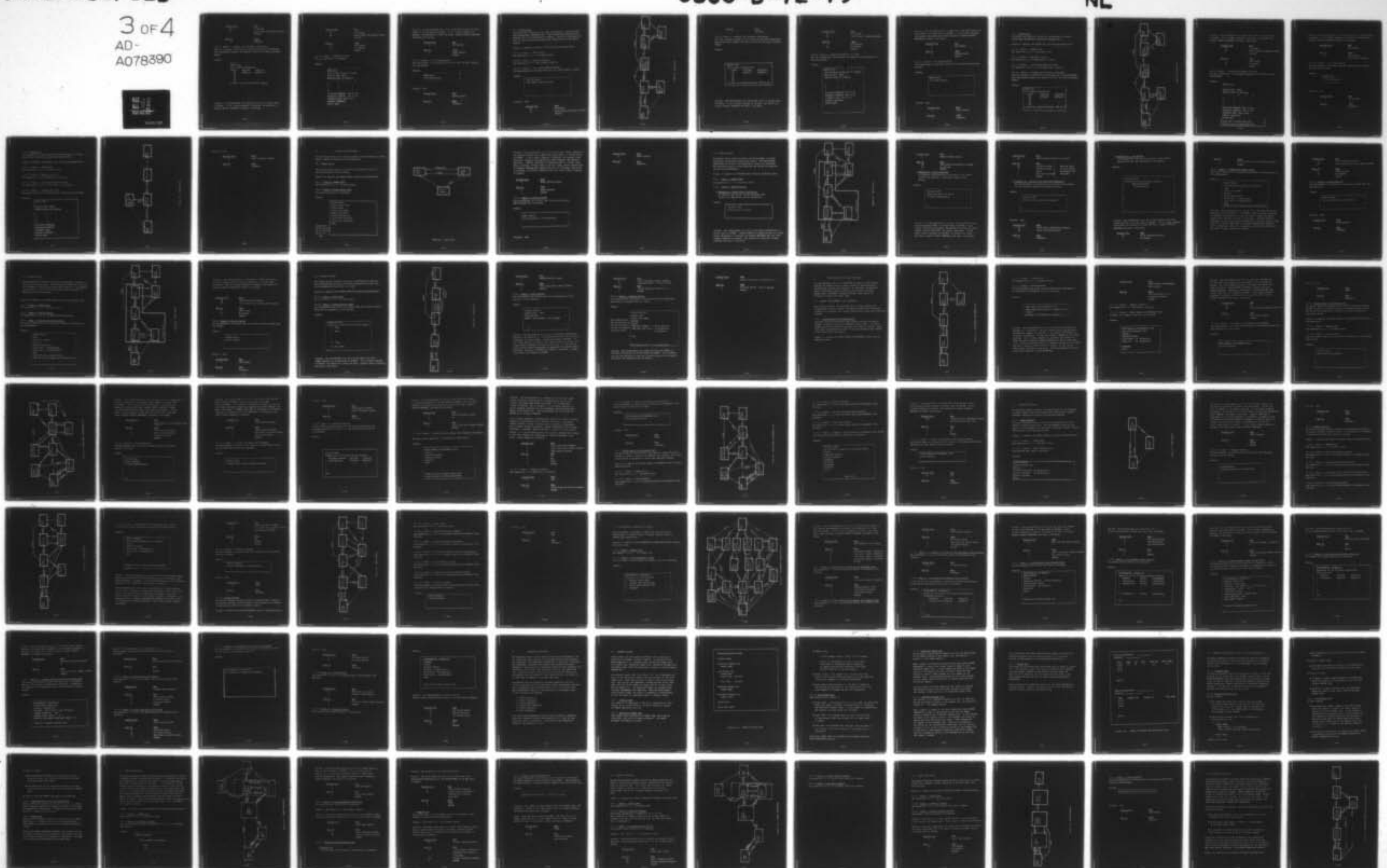


Figure 9-5. Enter Cell

AD-A078 390 INTERNATIONAL COMPUTING CO BETHESDA MD F/G 15/5
VESSEL TRAFFIC SERVICES PROCESSING/DISPLAY SUBSYSTEM SOFTWARE R--ETC(U)
SEP 79 C C HENSON , R S GRAHAM , B A MCINTOSH DOT-CG-81-78-1833

UNCLASSIFIED USCG-D-72-79 NL

3 OF 4
AD-
A078390



Entered From	When
2E	NO pressed
2F	Valid range and bearing values entered

Exit To	When
1	Automatic

9.2.1.4 State 4 - Display Cell Boundary Coordinates

The cell boundary coordinates are displayed and the watchstander must acknowledge whether the desired location has been accurately mapped.

Display:

```
ENTER CELL
Cell Corner Locations are:
Corner     Latitude     Longitude
   NE      dd°mm'ss"    ddd°mm'ss"
   SE          .            .
   NW          .            .
   SW          .            .
Is this the location desired? (Yes or
                                 No)
```

Actions: The watchstander will press YES or NO, or he may enter an ESCAPE. If an illegal response is entered, the system will display INVALID RESPONSE and await a new entry.

Entered From	When
2E	NO pressed
2F	Valid range and bearing values entered

Exit To	When
5	YES pressed
2A	NO pressed
1	ESCAPE

9.2.1.5 State 5 - Enter Cell Data

The cell data form is displayed.

Display:

```
ENTER CELL
Fill in the following fields:
MLLW OF CELL (FEET):
RELATIVE MLLW OF SUBCELLS:
          1    2    3    4
1.           -    -    -
2.           -    -    -
3.           -    -    -
4.           -    -    -
COLLISION EXEMPTED (YES or NO):
GROUNDING EXEMPTED (YES or NO):
CONGESTED AREA (YES or NO):
HAZARDS (KEYWORDS):
NOTICE TEXT:
```

Actions: The watchstander will fill in the data fields and press ENTER, or he may enter an ESCAPE. If an illegal response is entered, the system will clear the entry, display INVALID RESPONSE and await new entries.

Entered From	When
4	YES pressed

Exit To	When
6	ENTER pressed
1	ESCAPE

9.2.1.6 State 6 - Cell Data Entered

The watchstander is notified that the cell data has been entered into the system.

Display:

```
ENTER CELL
Cell Data Entered
```

Actions: None

Entered From	When
5	ENTER pressed

Exit To	When
1	Automatic

9.2.2 Modify Cell

The Modify Cell function allows the watchstander to modify system data concerning a waterway cell. The watchstander specifies the waterway cell to be modified by location. The data concerning the cell is then displayed and opened for modification by the watchstander.

Figure 9-6 depicts the MODIFY CELL function described below.

9.2.2.1 State 1 - Ready State

See subsection 6.2.1.1, the Ready State.

9.2.2.2 State 2 - Specify Location

See subsection 6.2.3, Specifying a Location.

9.2.2.3 State 3 - Cell Record Does Not Exist

The watchstander is notified that the cell record does not exist.

Display:

```
Function Name
Cell Record Does Not Exist
```

Actions: None

Entered From	When
2E	NO pressed
2F	Valid range and bearing values entered

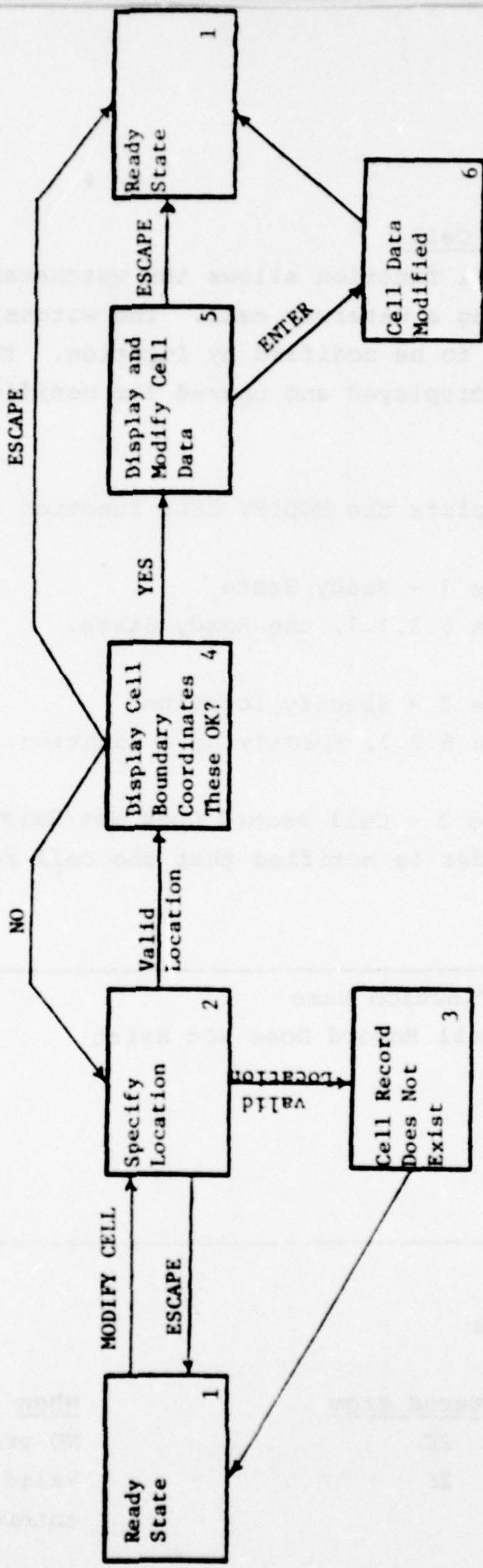


Figure 9-6. Modify Cell

Exit To	When
1	Automatic

9.2.2.4 State 4 - Display Cell Boundary Coordinates

The cell boundary coordinates are displayed and the watchstander must acknowledge whether the desired location has been accurately mapped.

Display:

```
MODIFY CELL
Cell Corner Locations are:
   Corner        Latitude         Longitude
    NE           dd°mm'ss"        ddd°mm'ss"
    SE               .                .
    NW               .                .
    SW               .                .
Is this the location desired? (Yes or No)
```

Actions: The watchstander will press YES or NO, or he may enter an ESCAPE. If an illegal response is entered, the system will display INVALID RESPONSE and await a new entry.

Entered From	When
2E	NO pressed
2F	Valid range & bearing entered

Exit To	When
5	YES pressed
2A	NO pressed
1	ESCAPE

9.2.2.5 State 5 - Display and Modify Cell Data

The cell system data is displayed and opened for modification by the watchstander.

Display:

```
MODIFY CELL
The following fields may be changed:
MLLW OF CELL (FEET):
RELATIVE MLLW OF SUBCELLS:
             1     2     3     4
1.                -     -     -
2.                -     -     -
3.                -     -     -
4.                -     -     -
COLLISION EXEMPTED (YES or NO)
GROUNDING EXEMPTED (YES or NO)
CONGESTED AREA (YES or NO)
HAZARDS (KEYWORDS):
NOTICE TEXT:
```

Actions: The watchstander will change any of the data fields and press ENTER, or he may enter an ESCAPE. If an illegal response is entered, the system will clear the entry, display INVALID RESPONSE and await a new entry.

Entered From	When
4	YES pressed

Exit To	When
6	ENTER pressed
1	ESCAPE

9.2.2.6 State 6 - All Data Modified

The watchstander is notified that the cell system data has been entered.

Display:

```
MODIFY CELL
Cell Data Modified
```

Actions: None

Entered From	When
5	ENTER pressed

Exit To	When
1	Automatic

9.2.3 Delete Cell

The Delete Cell function allows the watchstander to delete system data concerning a specified waterway cell.

Figure 9-7 depicts the DELETE CELL function described below.

9.2.3.1 State 1 - Ready State

See subsection 6.2.1.1, the Ready State.

9.2.3.2 State 2 - Specify Location

See subsection 6.2.3, Specifying a Location.

9.2.3.3 State 3 - Cell Record Does Not Exist

See subsection 9.2.2.3 of the Modify Cell function.

9.2.3.4 State 4 - Display Cell Boundary Coordinates

The cell boundary coordinates are displayed and the watchstander must acknowledge whether the desired location has been accurately mapped.

Display:

```
DELETE CELL
Cell Corner locations are:
   Corner        Latitude       Longitude
     NE          dd°mm'ss"      ddd°mm'ss"
     SE             .               .
     NW             .               .
     SW             .               .
Is this the location desired? (YES or NO)
```

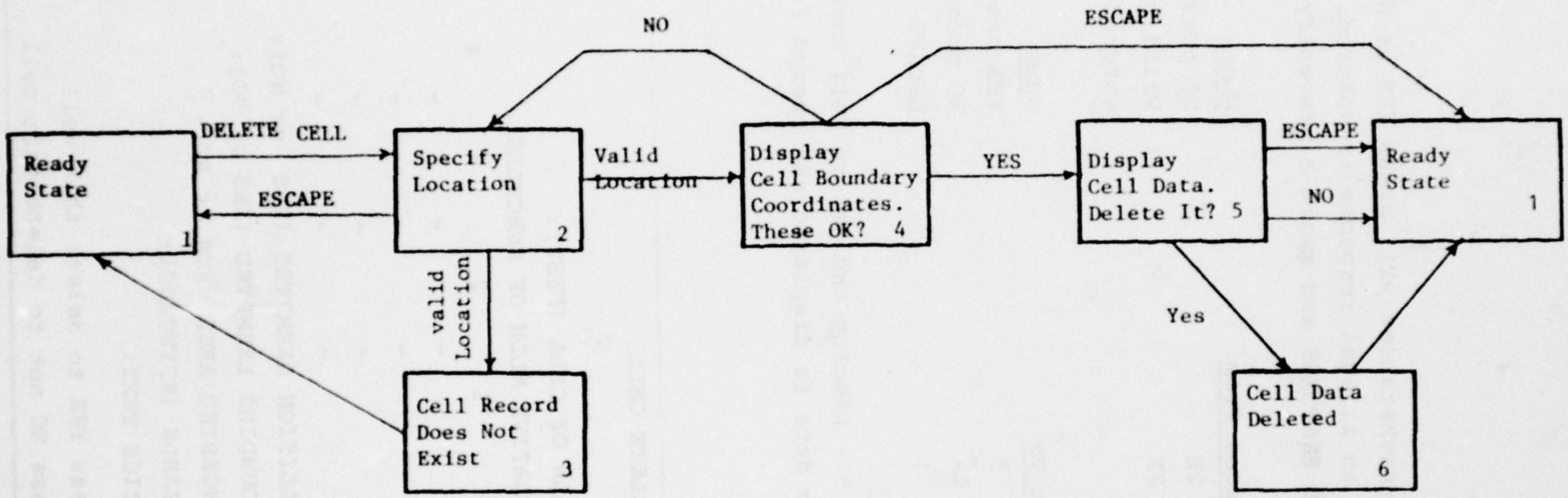


Figure 9-7. Delete Cell

Actions: The watchstander will press YES or NO, or he may enter an ESCAPE. If an illegal response is entered, the system will display INVALID RESPONSE and await a new entry.

Entered From	When
2E	NO pressed
2F	Valid range and bearing values entered

Exit To	When
5	YES pressed
2A	NO pressed
1	ESCAPE

9.2.3.5 State 5 - Display and Delete Cell Data

The cell system data is displayed and opened for deletion by the watchstander.

Display:

```
DELETE CELL

MLLW OF CELL (FEET):
RELATIVE MLLW OF SUBCELLS:
          1        2          3       4
1.            -          -         -
2.            -          -         -
3.            -          -         -
4.            -          -         -
COLLISION EXEMPTED (YES  or NO):
GROUNDING EXEMPTED (YES or NO):
CONGESTED AREA (YES or NO):
HAZARDS (KEYWORDS):
NOTICE TEXT:

Press YES to delete this cell
Press NO not to delete this cell
```

Actions: The watchstander will press YES or NO, or he may enter an ESCAPE. If an illegal response is entered, the system will display INVALID RESPONSE and await a new entry.

Entered From	When
4	YES pressed

Exit To	When
6	YES pressed
1	NO or ESCAPE pressed

9.2.3.6 State 6 - Cell Data Deleted

The watchstander is notified that the designated cell system data has been deleted.

Display:

```
DELETE CELL
Cell Data Deleted
```

Actions: None

Entered From	When
5	YES pressed

Exit To	When
1	Automatic

9.2.4 Display Cell

The Display Cell function allows the watchstander to display system data concerning a specified waterway cell.

Figure 9-8 depicts the DISPLAY CELL function described below.

9.2.4.1 State 1 - Ready State

See subsection 6.2.1 .1, the Ready State.

9.2.4.2 State 2 - Specify Location

See subsection 6.2.3, Specifying a Location.

9.2.4.3 State 3 - Cell Record Does Not Exist

See subsection 9.2.2.3 of the Modify Cell function.

9.2.4.4 State 4 - Display Cell Data

The system data for the waterway cell specified is displayed.

Display:

```
DISPLAY CELL

MLLW OF CELL (FEET):
RELATIVE MLLW OF SUBCELLS:
        1     2     3     4
1.         -     -     -
2.         -     -     -
3.         -     -     -
4.         -     -     -
COLLISION EXEMPTED:
GROUNDING EXEMPTED:
CONGESTED AREA:
HAZARDS (KEYWORDS):
NOTICE TEXT:
```

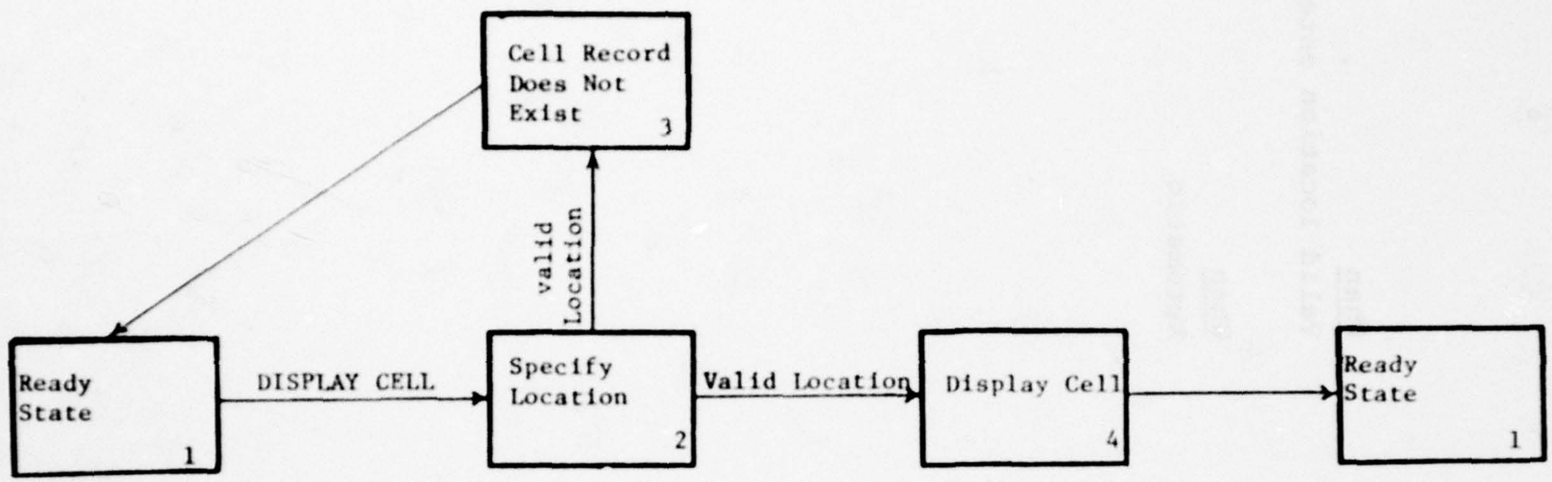


Figure 9-8. Display Cell

Actions: None

Entered From	When
2	Valid location entered

Exit To	When
1	Automatic

10 NOTICE FILE FUNCTIONS

The following notice file functions permit the watchstander to enter, modify, delete or display notice system data.

10.1 ENTER NOTICE

The Enter Notice function allows the watchstander to enter a particular notice into the system.

Figure 10-1 depicts the ENTER NOTICE function described below.

10.1.1 State 1 - Ready State

See subsection 6.2.1.1, the Ready State.

10.1.2 State 2 - Enter Notice Data

The notice data form is displayed.

Display:

```
ENTER NOTICE
Enter Notice Data
Notice Type:
Light List Number:
Sectors Covered:
Navaid Designation:
Valid From Time/Date:
Valid Until Time/Date:
Text:
```

Screen Area May Be Rolled Up or Down To Enter Long Text

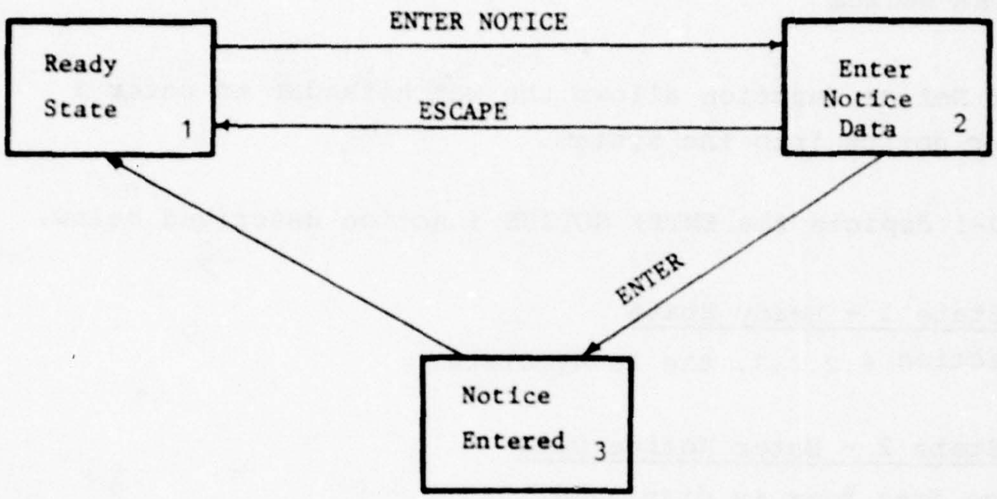


Figure 10-1. Enter Notice

Actions: The watchstander will fill in the data fields, separating the sectors covered with commas, and press ENTER, or he may enter an ESCAPE. If an illegal response is entered, the system clears the entry, displays the appropriate error message, and awaits a new entry. INVALID TIME/DATE is displayed when an illegal time/date is entered, INVALID SECTOR when an illegal sector designation is entered, MAXIMUM TEXT LENGTH when the 160 character text limit is exceeded, and INVALID RESPONSE when any other illegal response is entered.

Entered From	When
1	ENTER NOTICE pressed

Exit To	When
3	ENTER pressed
1	ESCAPE

10.1.3 State 3 - Notice Entered

The watchstander is notified that the notice data has been entered into the system.

Display:

```
ENTER NOTICE
Notice Entered at hh-mm/mm-dd-yy
```

Actions: None

Entered From	When
2	ENTER pressed

Exit To	When
1	Automatic

10.2 MODIFY NOTICE

The Modify Notice function allows the watchstander to modify system data concerning a particular notice. The watchstander identifies the notice to be modified by sector and time/date. The specified notice is then displayed and opened for modification by the watchstander.

Figure 10-2 depicts the MODIFY NOTICE function described below.

10.2.1 State 1 - Ready State

See subsection 6.2.1.1, the Ready State.

10.2.2 State 2 - Specify Notice

- Substate 2A - Enter Sector for Notice
  To identify the notice, the watchstander must specify the appropriate sector designation.

Display:

```
Function Name
Enter Sector for Notice


___
```

Actions: The watchstander will fill in the sector designation, or he may enter an ESCAPE. INVALID SECTOR is displayed when an illegal sector designation is entered and INVALID RESPONSE when any other illegal response is entered. The system will clear any illegal response and await a new entry.

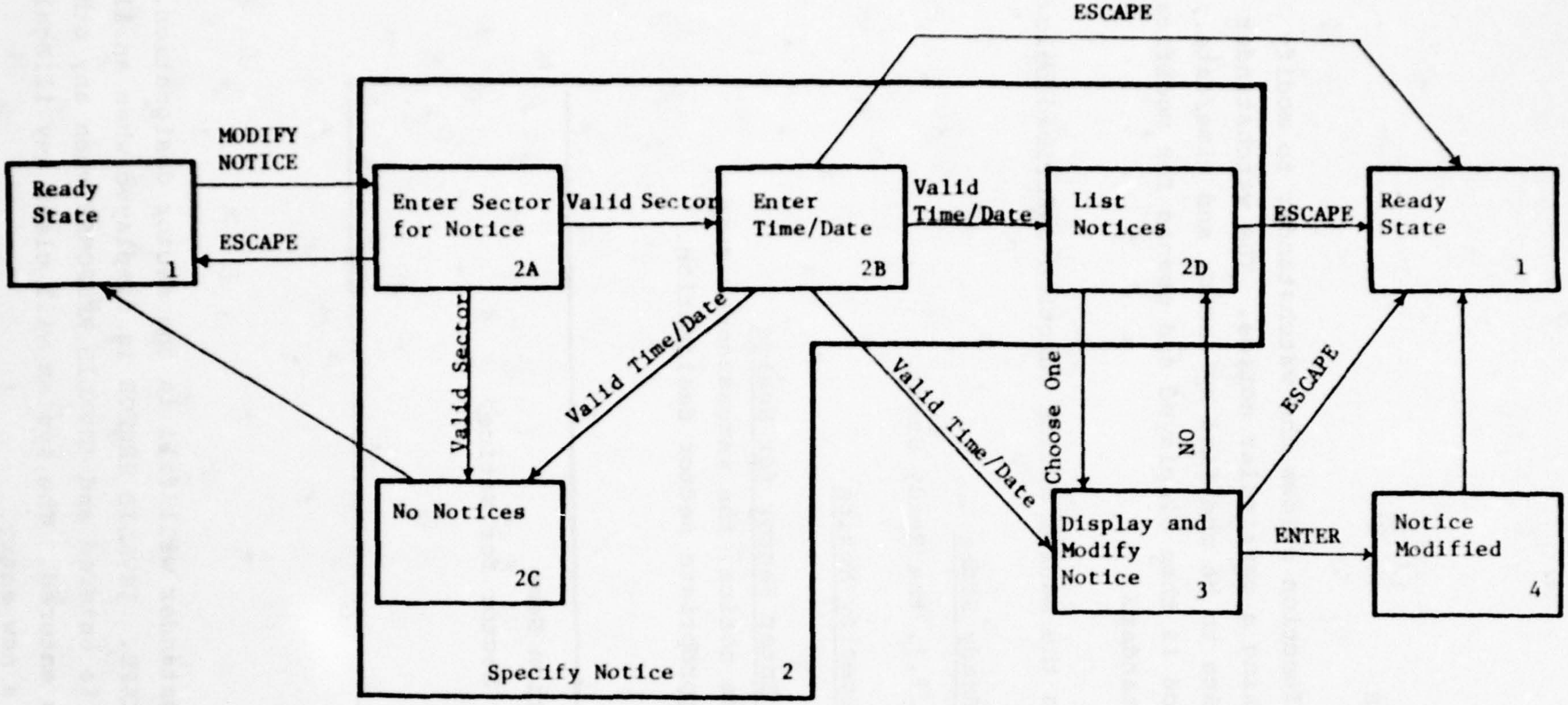


Figure 10-2. Modify Notice

Entered From	When
1	MODIFY NOTICE pressed

Exit To	When
2B	Valid sector designation entered
2C	No notices
1	ESCAPE

- Substate 2B - Enter Time/Date

  To complete identification of the notice, the watchstander must specify a time/date covered by the notice.

Display:

```
Function Name
Enter Time/Date for Notice
In Form hh:mm/mm-dd-yy



__
```

Actions: The watchstander will fill in the time/date of the notice and press ENTER, or he may enter an ESCAPE. If an illegal time/date is entered, the system will clear the entry, display INVALID TIME/DATE, and await a new entry. If any other illegal response is entered, the system will clear the entry, display INVALID RESPONSE, and await a new entry.

Entered From	When
2A	Valid sector designation entered

Exit To	When	
2C	No notice exists	Based on entry of valid sector designation and time/date
2D	Several notices exist	
3	One notice exists	
1	ESCAPE	

- Substate 2C - No Notice for Specified Parameters

The watchstander is notified that no notice corresponding to the previously specified parameters exists.

Display:

```
Function Name
No Notice for Specified Parameters
```

Actions: None.

Entered From	When
2A	Valid sector designation entered
2B	Valid time/date entered

Exit To	When
1	Automatic

- <u>Substate 2D - List Notices</u>

  The watchstander must select the notice entry number desired from the list appearing on the display.

Display:

```
  Function Name
  Choose one of the following notices:
        TIME/DATE/ENTERED
1.        hh:mm/dd-mm-yy
2.            .
.             .
.             .
.             .
n.            .



  __
```

Actions: The watchstander will fill in the notice list entry number desired, or he may enter an ESCAPE. If an illegal response is entered, the system will clear the entry, display INVALID RESPONSE and await a new entry.

<u>Entered From</u>	<u>When</u>
2B	Valid time/date entered
3	NO pressed

Exit To	Where
3	Valid notice list entry number entered
1	ESCAPE

10.2.3 State 3 - Display and Modify Notice

The notice system data is displayed and opened for modification by the watchstander.

Display:

```
MODIFY NOTICE
The following fields may be changed:
Type:
Light List Number:
Sectors:
Navaid Designation:
Valid From:  hh:mm/mm-dd-yy
Valid Until: hh:mm/mm-dd-yy
Text:
Press NO key to Display Sector Notice List
```

Actions: The watchstander will change any of the data fields and then press either ENTER, NO, or ESCAPE. When an illegal response is entered, the system will clear the entry, display the appropriate error message, and await a new entry. INVALID SECTOR is displayed if an illegal sector designation is entered, INVALID TIME/DATE if an illegal TIME/DATE is entered, MAXIMUM TEXT LENGTH if the 160 character text limit is exceeded, and INVALID RESPONSE if any other illegal response is entered.

Entered From	When
2B	Valid time/date entered
2D	Valid notice list entry number entered

Exit To	When
4	ENTER pressed
2D	NO pressed
1	ESCAPE

10.2.4 State 4 - Notice Modified

The watchstander is notified that the notice system data has been modified.

Display:

```
MODIFY NOTICE
Notice Modified at hh:mm/mm-dd-yy
```

Actions: None.

Entered From	When
3	ENTER pressed

Exit To	When
1	Automatic

10.3 DELETE NOTICE

The Delete Notice function allows the watchstander to delete a notice from the data base. The watchstander specifies the notice to be deleted by sector designation and time/date to be covered by the notice. The notice is then displayed and opened for deletion by the watchstander.

Figure 10-3 depicts the DELETE NOTICE function described below.

10.3.1 State 1 - Ready State

See subsection 6.2.1.1, the Ready State.

10.3.2 State 2 - Specify Notice

See subsection 10.2.2 of the MODIFY NOTICE function.

10.3.3 State 3 - Display and Delete Notice

The notice system data is displayed and opened for deletion by the watchstander.

Display:

```
DELETE NOTICE
Type:
Light List Number:
Sectors:
Navaid Designation:
Valid From:  hh:mm/mm-dd-yy
Valid Until:  hh:mm/mm-dd-yy
Text:
Press YES key to Delete Notice
Press NO key to Display Sector Notice List
```

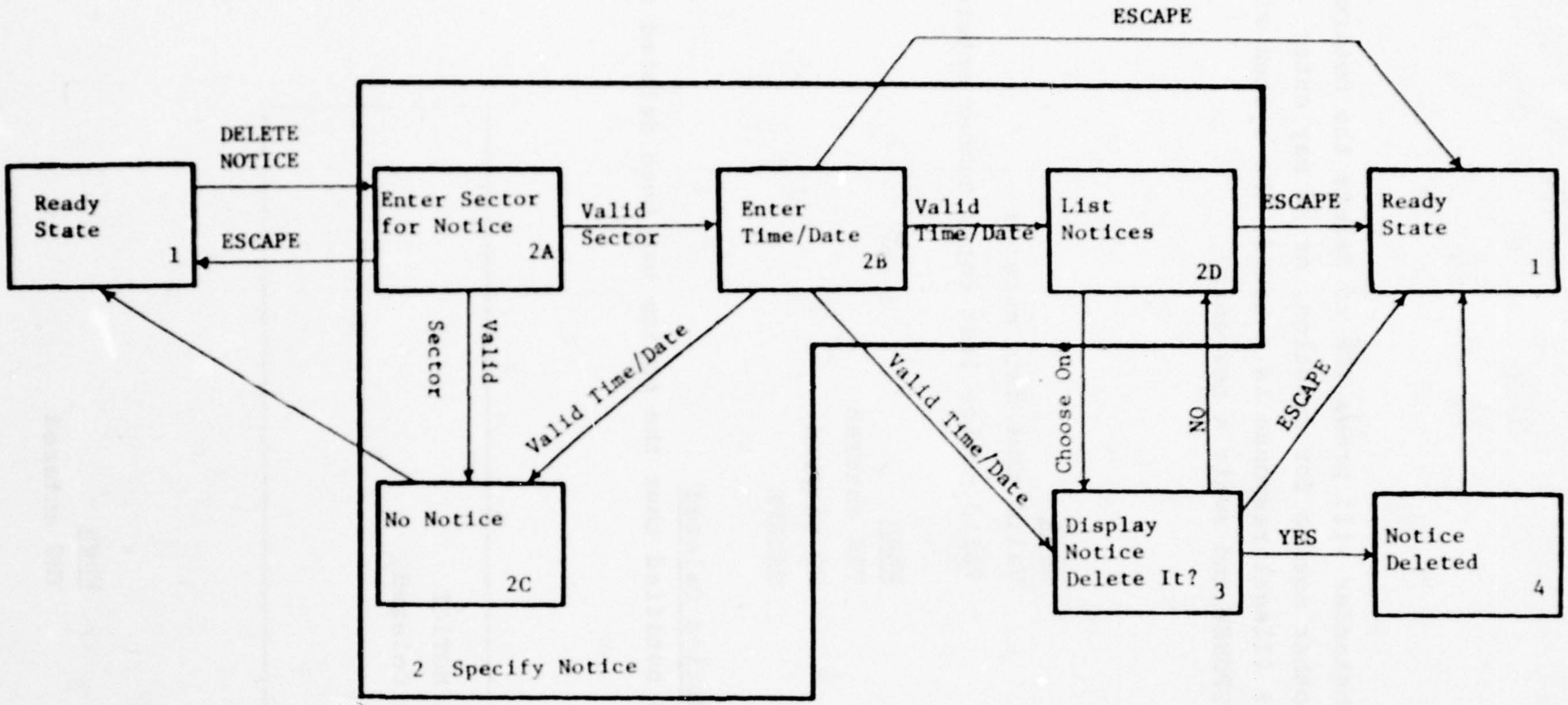


Figure 10-3. Delete Notice

Actions: The watchstander will press YES to delete the notice or NO to select another notice for deletion, or he may enter an ESCAPE. When an illegal response is entered, the system will display INVALID RESPONSE and await a new entry.

Entered From	When
2B	Valid time/date entered
2D	Valid notice list entry number entered

Exit To	When
4	YES entered
2D	NO entered
1	ESCAPE

10.3.4 State 4 - Notice Deleted

The watchstander is notified that the notice has been deleted from the system.

Display:

```
DELETE NOTICE
Notice Deleted
```

Actions: None.

Entered From	When
3	YES entered

Exit To	When
1	Automatic

10.4 DISPLAY NOTICES

The Display Notice function allows the watchstander to specify notice system data by type and sector designation and then view all corresponding notices one at a time.

Figure 10-4 depicts the DISPLAY NOTICE function described below.

10.4.1 State 1 - Ready State

See subsection 6.2.1.1, the Ready State.

10.4.2 State 2 - Display Notice Types

The watchstander must select the notice type entry number desired from the list appearing on the display.

Display:

```
DISPLAY NOTICES
Choose one of the following Notice Types:
    1.  type_1
    2.  type_2
    .   .
    .   .
    .   .
    N.  type_N
    N+1 ALL TYPES
____
```

Actions: The watchstander will fill in the type list entry number desired, or he may enter an ESCAPE. If an illegal response is entered, the system will clear the entry, display INVALID RESPONSE, and await a new entry.

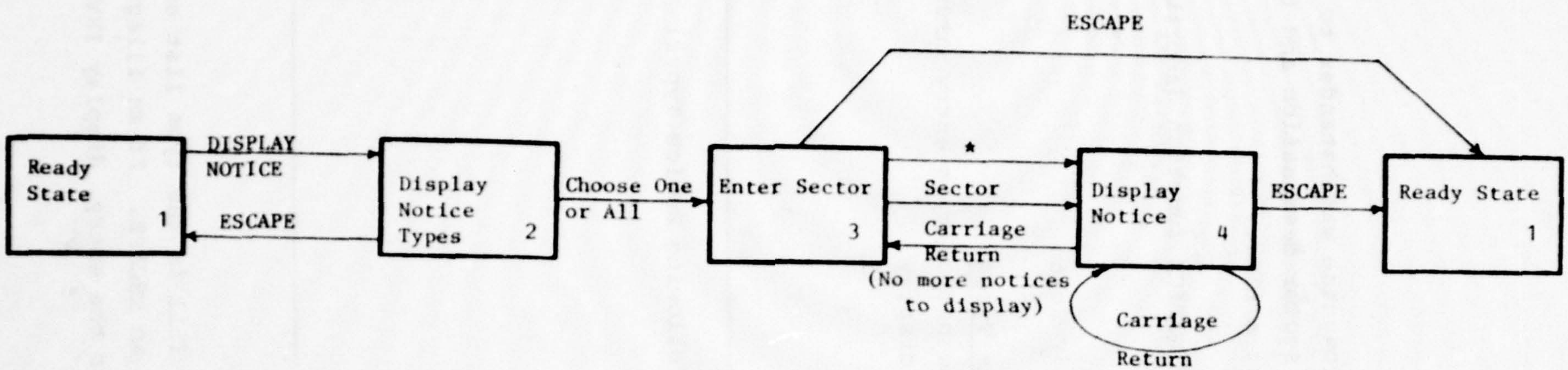


Figure 10-4. Display Notice

Entered From	When
1	DISPLAY NOTICE pressed

Exit To	When
3	Valid type entry number entered
1	ESCAPE

10.4.3 State 3 - Enter Sectors

The watchstander must specify the sector designation of the notice(s) to be displayed.

Display:

```
DISPLAY NOTICES
NOTICE TYPE:  type
ENTER SECTOR:
ENTER * FOR NOTICES OF ALL SECTORS


   ___
```

Actions: The watchstander will fill in the sector designation desired or an asterisk (*) if he wants the notices of all sectors displayed, and press ENTER. He may also enter an ESCAPE. If any other response is entered, the system clears the entry, displays INVALID RESPONSE and awaits a new entry. If no notices exist for the sector designation or asterisk, the system clears the entry, displays NO NOTICES and awaits a new entry. He may then enter a new sector or ESCAPE.

Entered From	When
2	Valid type entry number entered
4	Carriage RETURN - no more notices

Exit To	When
4	Notices exist for sector or *
1	ESCAPE

10.4.4 State 4 - Display Notices

All notices which correspond to the type and sector previously specified are displayed one at a time.

Display:

This Display Area May Be Scrolled Up or Down to Enable the W/S to Examine the Entire Text

```
DISPLAY NOTICES
NOTICE TYPE:
LIGHT LIST NUMBER:
SECTORS:
NAVAID:
TIME/DATE ENTERED:  hh:mm:ss/mm-dd-yy
TIME/DATE SPAN VALID:  hh:mm/mm-dd to
                       hh-mm/mm-dd

TEXT



Press carriage return to see the next notice
```

Actions: The watchstander will press the carriage RETURN to view the next notice, or he may enter an ESCAPE. If he presses the carriage RETURN and there are no more notices for the specified area, the system returns to State 3.

Entered From	When
3	Notice exists for the sector or *

Exit To	When
3	Carriage RETURN - end of notices
1	ESCAPE

11 ENVIRONMENTAL DATA FILE FUNCTIONS

The environmental data file functions included in this chapter provide the capabilities to enter, modify or delete manually-entered data records and forecasts. In addition, the Environmental Information Display function can be used to display manual data, forecasts, automatic weather sensor data, or automatic current/tide sensor data.

11.1 MANUAL ENVIRONMENTAL DATA FUNCTIONS

The following manual environmental data functions permit the watchstander to enter, modify, and delete system data concerning a manual environmental data record identified by sector and time/date entered.

11.1.1 Enter Manual Environmental Data

The Enter Manual Environmental Data function allows the watchstander to manually enter environmental system data. The watchstander specifies applicable sectors, map location, source, valid time span, keywords and the text of the environmental data record to be entered into the system.

Figure 11-1 depicts the ENTER MANUAL ENVIRONMENTAL DATA function described below.

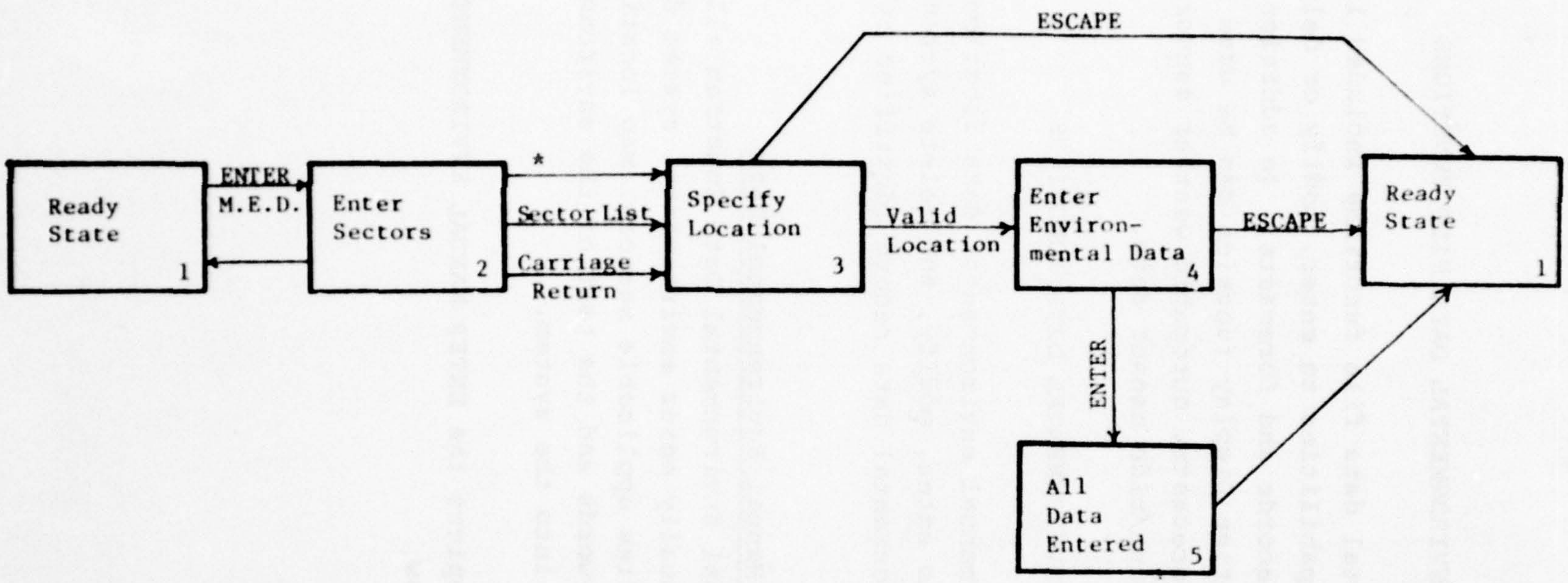


Figure 11-1. ENTER MANUAL ENVIRONMENTAL DATA

11.1.1.1 State 1 - Ready State

See subsection 6.2.1.1, the Ready State.

11.1.1.2 State 2 - Enter Sectors

The watchstander must enter the applicable sector designation of the manual environmental data to be entered.

Display:

```
ENTER MANUAL ENVIRONMENTAL DATA
Enter Applicable Sector(s) (separate with
commas)
Or Enter'*' To Specify All Sectors
```

Actions: The watchstander will fill in the sector designation (maximum of 4 characters) desired, several sector designations separated by commas, an asterisk (*) to specify all sectors, or no sector designation. He may also enter an ESCAPE or an illegal response. If an illegal response is entered, the system will clear the entry, display INVALID RESPONSE and await a new entry. If an illegal sector designation is entered, the system will clear the entry, display INVALID SECTOR X (where X is the invalid sector name) and await a new entry. The watchstander may cancel this sector input by a carriage RETURN.

Entered From	When
1	ENTER MANUAL ENVIRONMENTAL DATA pressed

Exit To	When
3	Valid sector(s), *, or no sector entered
1	ESCAPE

11.1.1.3 State 3 - Specify Location

See subsection 6.2.3, Specifying a Location.

11.1.1.4 State 4 - Enter Manual Environmental Data

A manual environmental data form is displayed.

Display:

```
ENTER MANUAL ENVIRONMENTAL DATA
Enter Environmental Data
SOURCE: _
SECTORS COVERED:
VALID FROM:  hh: mm/mm-dd-yy
VALID TO:    hh: mm/mm-dd-yy

KEYWORDS:
TEXT:
```

Actions: The watchstander will fill in the form, separating the keywords with commas, and press ENTER, or he may enter an ESCAPE. If a non-standard keyword is entered, the system will clear the entry, display INVALID KEYWORD X (where X is the invalid keyword), and await a new entry. The watchstander may cancel this input by a carriage RETURN. If any other illegal response is entered, the system will clear the entry, display INVALID RESPONSE, and await a new entry.

Entered From	When
3E	NO
3F	Valid range and bearing entered

Exit To	When
5	Valid data entered
1	ESCAPE

11.1.1.5 State 5 - All Manual Environmental Data Entered
The watchstander is notified that the manual environmental data have been entered into the system.

Display:

```
ENTER MANUAL ENVIRONMENTAL DATA
All Data Entered
```

Actions: None

Entered From	When
4	ENTER

Exit To	When
1	Automatic

11.1.2 Modify Manual Environmental Data

The Modify Manual Environmental Data function allows the watchstander to modify an existing manual environmental data record. The record to be modified is selected by sector covered and time/date entered.

Figure 11-2 depicts the MODIFY MANUAL ENVIRONMENTAL DATA function described below.

11.1.2.1 State 1 - Ready State

See subsection 6.2.1.1, the Ready State.

11.1.2.2 State 2 - Enter Sectors

The watchstander must enter the sector designation of the desired data record.

Display:

```
Function Name
Enter Sector Designation



_
```

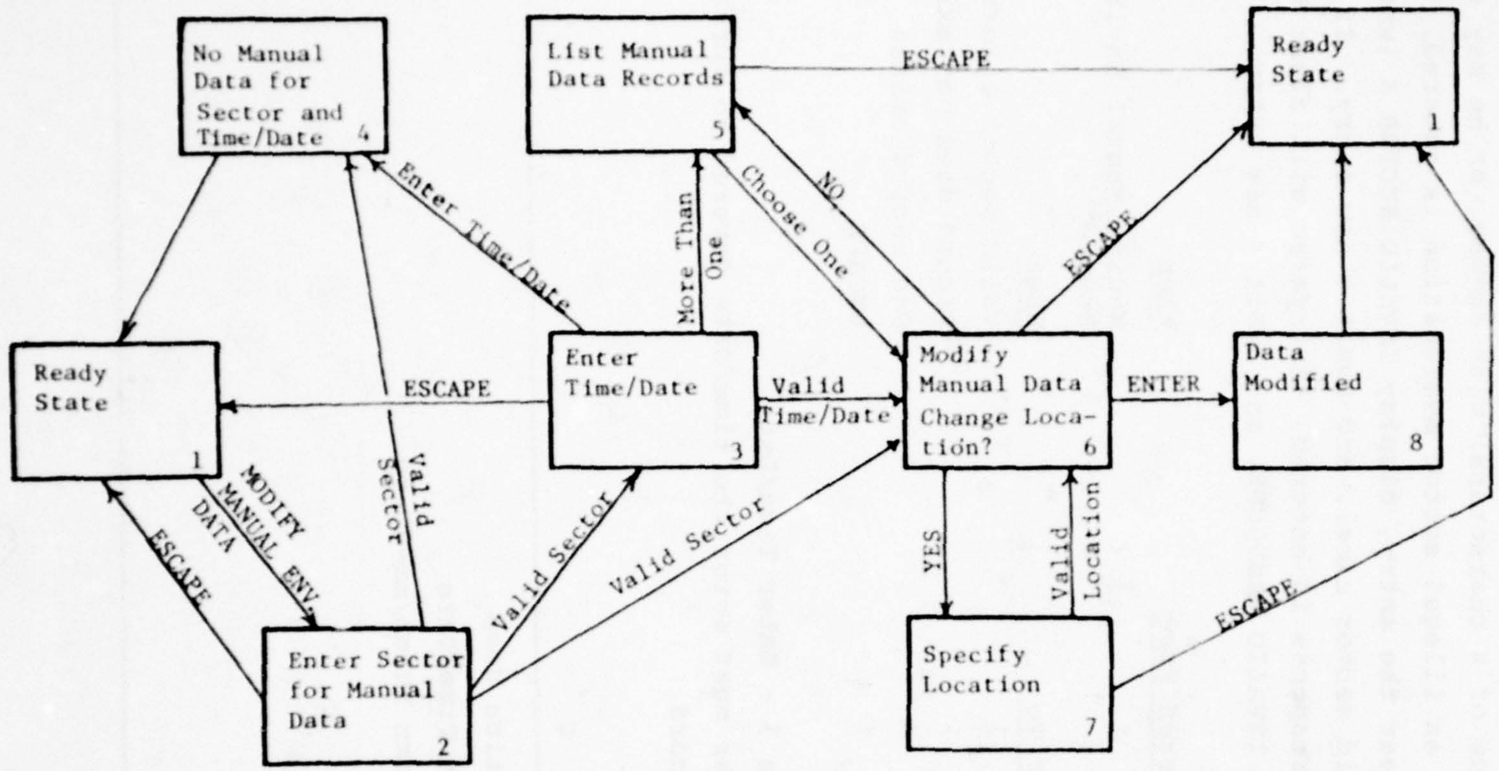


Figure 11-2. MODIFY MANUAL ENVIRONMENTAL DATA

Actions: The watchstander will fill in the sector(s), separating the entries (maximum of 4 characters) with commas, or he may enter an ESCAPE. If an illegal sector designation is entered, the system will clear the entry, display INVALID SECTOR X (where X is the invalid sector name), and await a new entry. If any other illegal response is entered, the system will clear the entry, display INVALID RESPONSE, and await a new entry.

Entered From	When
1	Modify Manual Environmental Data Pressed

Exit To	When
3	Valid sector entered
4	Record does not exist
6	One record exists
1	ESCAPE

11.1.2.3 State 3 - Enter Time/Date

The watchstander must enter the time/date covered to further specify the record.

Display:

```
Function Name
Enter Time/Date
In Form hh:mm/mm-dd-yy



___
```

Actions: The watchstander will fill in the time/date desired, press carriage RETURN to cancel this entry, or he may enter an ESCAPE. If an illegal response is entered, the system will clear the entry, display the appropriate error message, and await a new entry. INVALID TIME/DATE is displayed if an invalid time/date is entered and INVALID RESPONSE is displayed if any other illegal response is entered.

Entered From	When
2	Valid sector entered

Exit To	When
4	Record does not exist
5	More than one record exists
6	One record exists
1	ESCAPE

11.1.2.4 State 4 - No Data for Sector and Time/Date

The watchstander is notified that there is no data record covering the specified sector and time/date.

Display:

```
Function Name
No Manual Data Covering Specified Sector
```

Actions: None

Entered From	When
2	Valid sector entered
3	Valid time/date entered

Exit To	When
1	Automatic

11.1.2.5 State 5 - List Data Records

If more than one record exists for the sector designation and time/date specified, a list of all corresponding data records is displayed.

Display:

```
Function Name
Choose one of the following data records:
     Time/Date Entered      Latitude     Longitude
1.   hh:mm/dd-mm-yy         dd°mm'ss"    ddd°mm'ss"
2.        .                    .             .
.         .                    .             .
.         .                    .             .
n.        .                    .             .
____
```

Actions: The watchstander will fill in the list entry number of the record desired, or he may enter an ESCAPE. If an illegal response is entered, the system will clear the entry, display INVALID RESPONSE, and await a new entry.

Entered From	When
3	Valid time/date entered
6	NO

Exit To	When
6	Valid list entry number entered
1	ESCAPE

11.1.2.6 State 6 - Display & Modify Manual Environmental Data Record

The data record specified is displayed for modification.

Display:

```
MODIFY MANUAL ENVIRONMENTAL DATA
Source: _
Time/Date Entered:
Sectors Covered:
Keywords:
Text:




Press NO key to Display Record List
Press YES key to Change Coordinates
```

Actions: The watchstander will change any of the data items except Time/Date Entered which is automatically set to the current time/date when ENTER is pressed. If a coordinate change is desired, YES is pressed. If the record desired is not on display, pressing NO will redisplay the Manual Environmental Data record list. The watchstander may also enter an ESCAPE or an illegal response.

If an illegal response is entered, the system will clear the entry, display the appropriate error message, and await a new entry. INVALID SECTOR X (where X is the invalid sector) is displayed if an illegal sector is entered, INVALID TIME/DATE if an illegal time/date is entered. INVALID KEYWORD X (where X is the invalid keyword if a non-standard keyword is entered, MAXIMUM TEXT LENGTH if the text exceeds 160 characters or INVALID RESPONSE if any other illegal response is entered.

Entered From	When
3	Valid time/date entered
5	Valid list entry number entered
2	Valid sector entered

Exit To	When
5	NO
7	YES
8	ENTER
1	ESCAPE

11.1.2.7 State 7 - Specify Location

See subsection 6.2.3, Specifying a Location.

Entered From	When
6	YES

Exit To	When
6	Valid range and bearing entered
1	ESCAPE

11.1.2.8 State 8 - Manual Environmental Data Modified

The watchstander is notified that the manual environmental data record specified has been modified.

Display:

```
MODIFY MANUAL ENVIRONMENTAL DATA
Data Record Modified
```

Actions: None

Entered From	When
6	ENTER

Exit To	When
1	Automatic

11.1.3 Delete Manual Environmental Data

The Delete Manual Environmental Data function allows the watchstander to delete a manual environmental data record. The record to be deleted is selected by sector and time/date covered.

Figure 11-3 depicts the DELETE MANUAL ENVIRONMENTAL DATA function described below.

11.1.3.1 State 1 - Ready State

See subsection 6.2.1.1, the Ready State.

11.1.3.2 State 2 - Enter Sectors

See subsection 11.1.2.2 of the Modify Manual Environmental Data function.

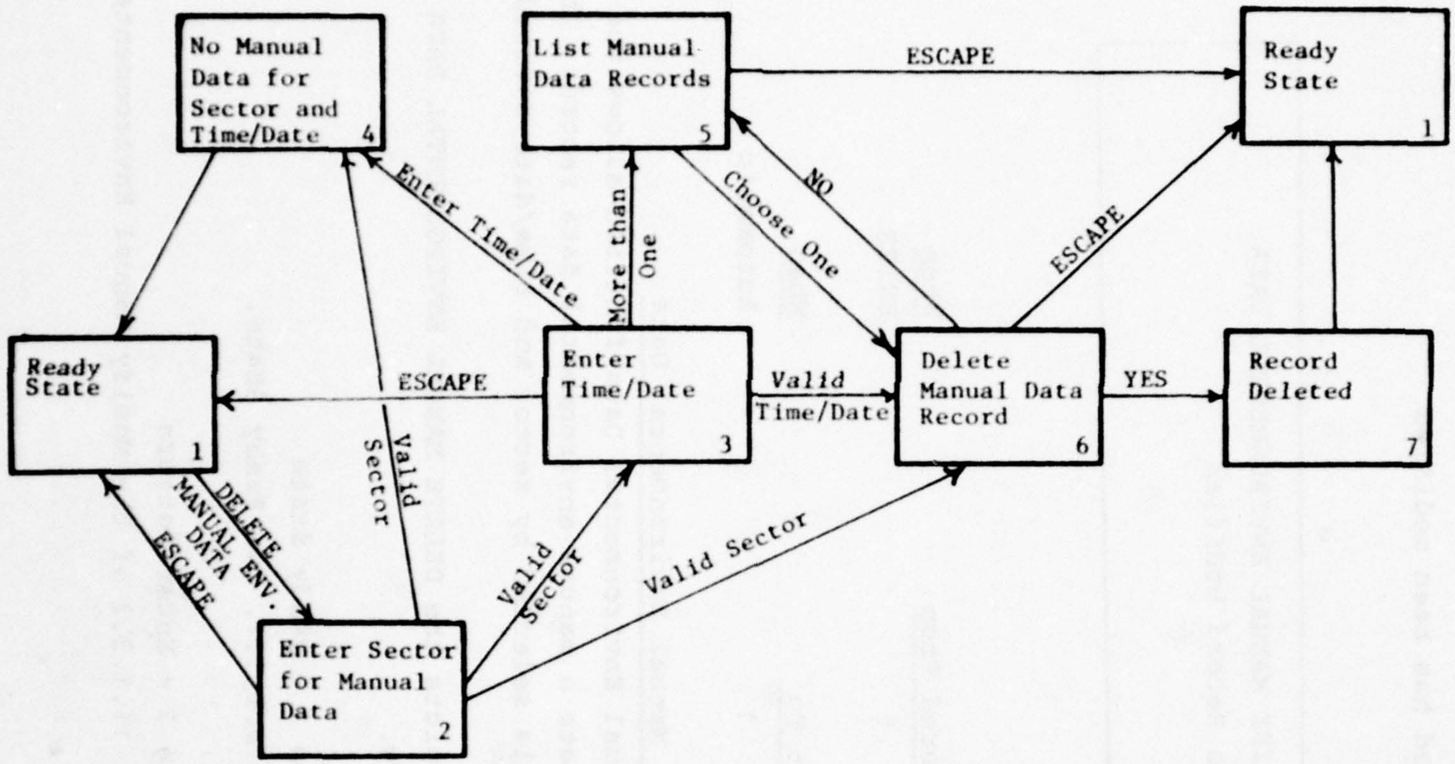


Figure 11-3. DELETE MANUAL ENVIRONMENTAL DATA

11.1.3.3 State 3 - Enter Time/Date

See subsection 11.1.2.3 of the Modify Manual Environmental Data function.

11.1.3.4 State 4 - No Data for Sector and Time/Date

See subsection 11.1.2.4 of the Modify Manual Environmental Data function.

11.1.3.5 State 5 - List Data Records

See subsection 11.1.2.5 of the Modify Manual Environmental Data function.

11.1.3.6 State 6 - Display & Delete Manual Environmental Data Record

The data record specified is displayed for deletion.

Display:

```
Function Name
Do you wish to delete the following record?
Source:
Time/Date Entered:
Sectors Covered:
Location:
Latitude:
Longitude:
Keywords:
Text:

                    (Yes or No)
```

Actions: The watchstander will press YES to delete the record, NO to select another record, or he may enter an ESCAPE. If an illegal response is entered, the system will display INVALID RESPONSE and await a new entry.

Entered From	When
2/3	Valid sector or time/date entered
5	Record selected from list

Exit To	When
7	YES
5	NO
1	ESCAPE

11.1.3.7 State 7 - Manual Environmental Data Record Deleted

The watchstander is notified that the manual environmental data record specified has been deleted from the system.

Display:

```
DELETE MANUAL ENVIRONMENTAL DATA
Record Deleted
```

Actions: None

Entered From	When
6	YES

Exit To	When
1	Automatic

11.2 FORECAST FUNCTIONS

The following manual forecast functions permit the watchstander to enter, modify, and delete system data concerning a weather forecast identified by sector and time/date entered.

11.2.1 Enter Forecast

The Enter Forecast function allows the watchstander to enter weather forecast system data. The watchstander specifies the source of the forecast, the applicable time span, sectors covered and the text of the forecast record.

Figure 11-4 depicts the ENTER FORECAST function described below.

11.2.1.1 State 1 - Ready State

See subsection 6.2.1.1, the Ready State.

11.2.1.2 State 2 - Enter Forecast Data

The forecast data form is displayed.

Display:

```
ENTER FORECAST
Enter Forecast Data
Source: _
Starting Time/Date (hh:mm/mm-dd-yy):
Ending Time/Date   (hh:mm/mm-dd-yy):
Sectors Covered:
Text:
```

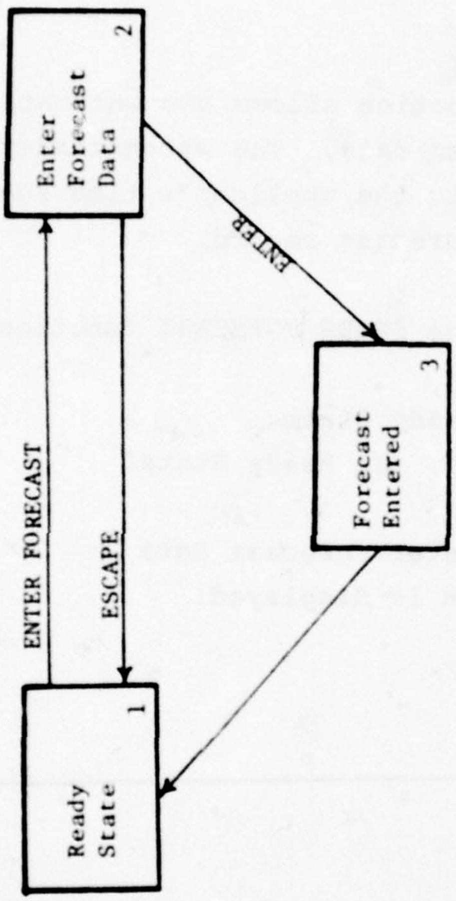


Figure 11-4. ENTER FORECAST

Actions: The watchstander will fill in the form, separating the sectors covered with commas, and press ENTER. He may also enter an ESCAPE or an illegal response. If an illegal response is entered, the system will clear the entry, display the appropriate error message, and await a new entry. INVALID TIME/DATE is displayed if an invalid time/date is entered or no entry is made in Time/Date field after ENTER is pressed, and INVALID SECTOR X (where X is the invalid sector) is displayed if an invalid sector designation is entered. If any other illegal response is entered, the system will display INVALID RESPONSE.

Entered From	When
1	ENTER FORECAST

Exit To	When
3	ENTER
1	ESCAPE

11.2.1.3 State 3 - Forecast Entered

The watchstander is notified that the forecast data have been entered into the system.

Display:

```
ENTER FORECAST
Forecast Entered at hh:mm/mm-dd-yy
```

Actions: None

Entered From	When
2	ENTER

Exit To	When
1	Automatic

11.2.2 Modify Forecast

The Modify Forecast function allows the watchstander to modify an existing weather forecast record. The forecast to be modified is selected by sector and time/date covered.

Figure 11-5 depicts the MODIFY FORECAST function described below.

11.2.2.1 State 1 - Ready State

See subsection 6.2.1.1, the Ready State.

11.2.2.2 State 2 - Enter Sectors for Forecast

See subsection 11.1.2.2 of the Modify Manual Environmental Data function.

11.2.2.3 State 3 - Enter Time/Date for Forecast

See subsection 11.1.2.3 of the Modify Manual Environmental Data function.

11.2.2.4 State 4 - No Forecast Data for Sector and Time/Date

See subsection 11.1.2.4 of the Modify Manual Environmental Data function.

11.2.2.5 State 5 - List Forecast Records

See subsection 11.1.2.5 of the Modify Manual Environmental Data function.

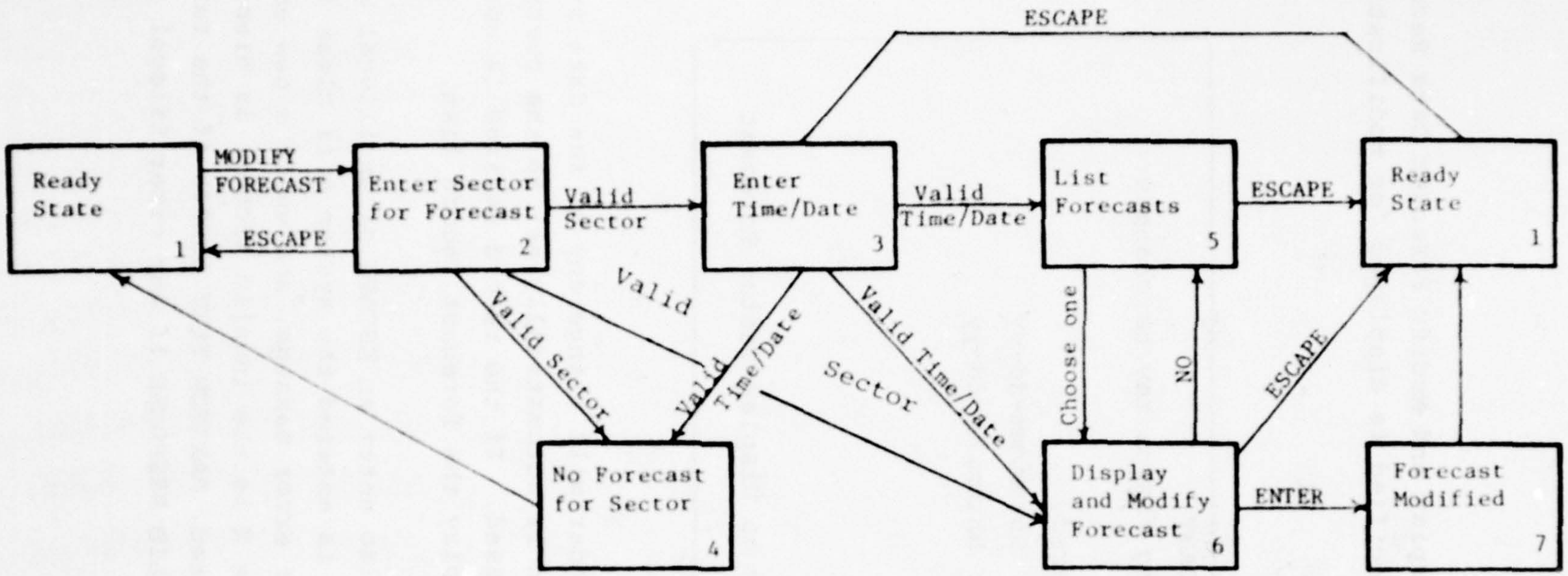


Figure 11-5. MODIFY FORECAST

11.2.2.6 State 6 - Display and Modify Forecast Data Record
The forecast record specified is displayed for modification.

Display:

```
MODIFY FORECAST
The following fields may be changed:
Source: _
Sectors Covered:
Valid From:  hh:mm/mm-dd-yy
Valid Until: hh:mm/mm-dd-yy
Text:




Press NO key to Display Sector Forecast
List.
```

Actions: The watchstander will change any of the data items except Time/Date Entered which is automatically set to the current time/date when ENTER is pressed. If the record desired is not on display, pressing NO will redisplay the forecast record list.

The watchstander may also enter an ESCAPE or an illegal response. If an illegal response is entered the system will clear the entry, display the appropriate error message, and await a new entry. INVALID SECTOR X (where X is the invalid sector) is displayed if an illegal sector is entered, MAXIMUM TEXT LENGTH if the text exceeds 160 characters or INVALID RESPONSE if any other illegal response is entered.

Entered From	When
3	Valid time/date entered
5	Valid list entry number entered
2	Valid sector entered

Exit To	When
5	NO
7	ENTER
1	ESCAPE

11.2.2.7 State 7 - Forecast Modified

The watchstander is notified that the forecast record specified has been modified.

Display:

```
MODIFY FORECAST
Forecast Modified at hh:mm/mm-dd-yy
```

Action: None

Entered From	When
6	ENTER

Exit To	When
1	Automatic

11.2.3 Delete Forecast

The Delete Forecast function allows the watchstander to delete an existing weather forecast record. The forecast to be deleted is selected by sector and time/date covered.

Figure 11-6 depicts the DELETE FORECAST function described below.

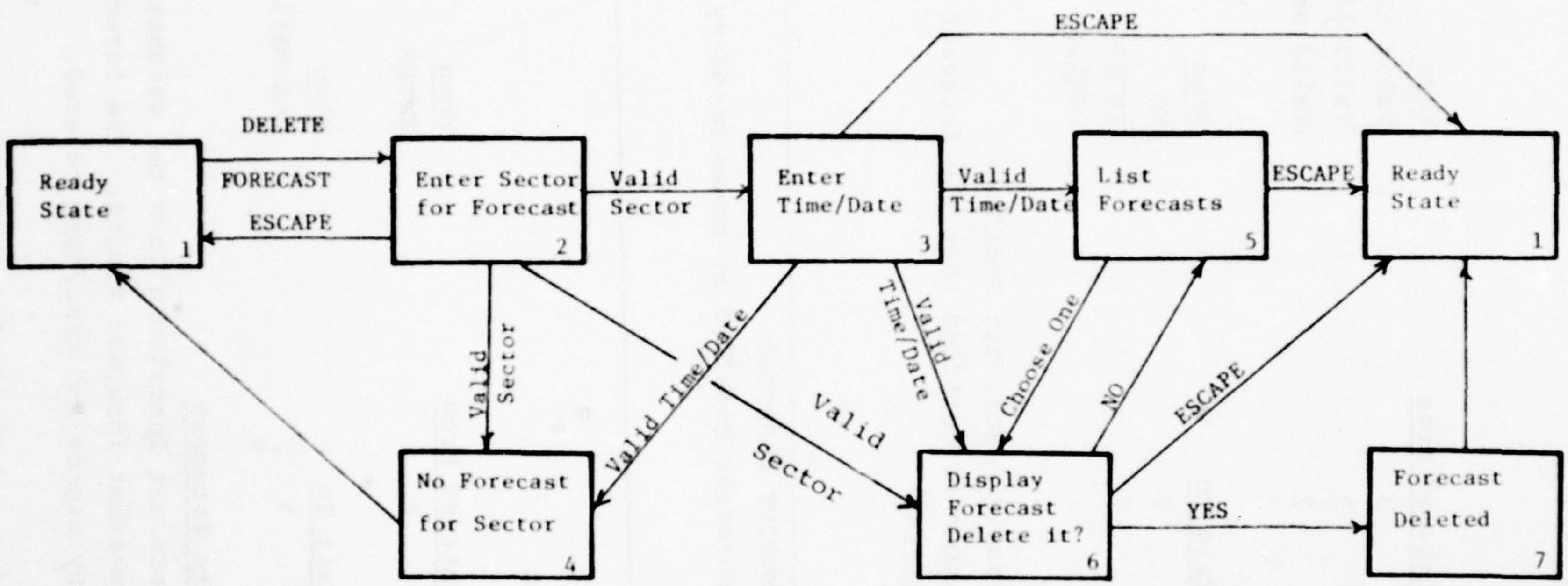


Figure 11-6. DELETE FORECAST

11.2.3.1 State 1 - Ready State

See subsection 6.2.1.1, the Ready State.

11.2.3.2 State 2 - Enter Sectors for Forecast

See subsection 11.1.2.2. of the Modify Manual Environmental Data function.

11.2.3.3 State 3 - Enter Time/Date for Forecast

See subsection 11.1.2.3 of the Modify Manual Environmental Data function.

11.2.3.4 State 4 - No Forecast Data for Sector and Time/Date

See subsection 11.1.2.4 of the Modify Manual Environmental Data function.

11.2.3.5 State 5 - List Forecast Records

See subsection 11.1.2.5 of the Modify Manual Environmental Data function.

11.2.3.6 State 6 - Display and Delete Forecast Record

See subsection 11.1.3.6 of the Delete Manual Environmental Data function.

11.2.3.7 State 7 - Forecast Deleted

The watchstander is notified that the forecast data record specified has been deleted from the system.

Display:

```
DELETE FORECAST
Forecast Deleted
```

Actions: None

Entered From	When
6	YES

Exit To	When
1	Automatic

11.3 ENVIRONMENTAL INFORMATION DISPLAY

The Environmental Information Display function allows the watchstander to display manual, forecast, weather sensor or current/tide sensor data.

Figure 11-7 depicts the ENVIRONMENTAL INFORMATION DISPLAY function described below.

11.3.1 State 1 - Ready State

See subsection 6.2.1.1, the Ready State

11.3.2 State 2 - List Information Types

The four types of environmental information data are displayed.

Display:

```
ENVIRONMENTAL INFORMATION
Choose one of the following:
1.  Weather Sensor Data
2.  Current/Tide Sensor Data
3.  Manual Environmental Data
4.  Forecast



 __
```

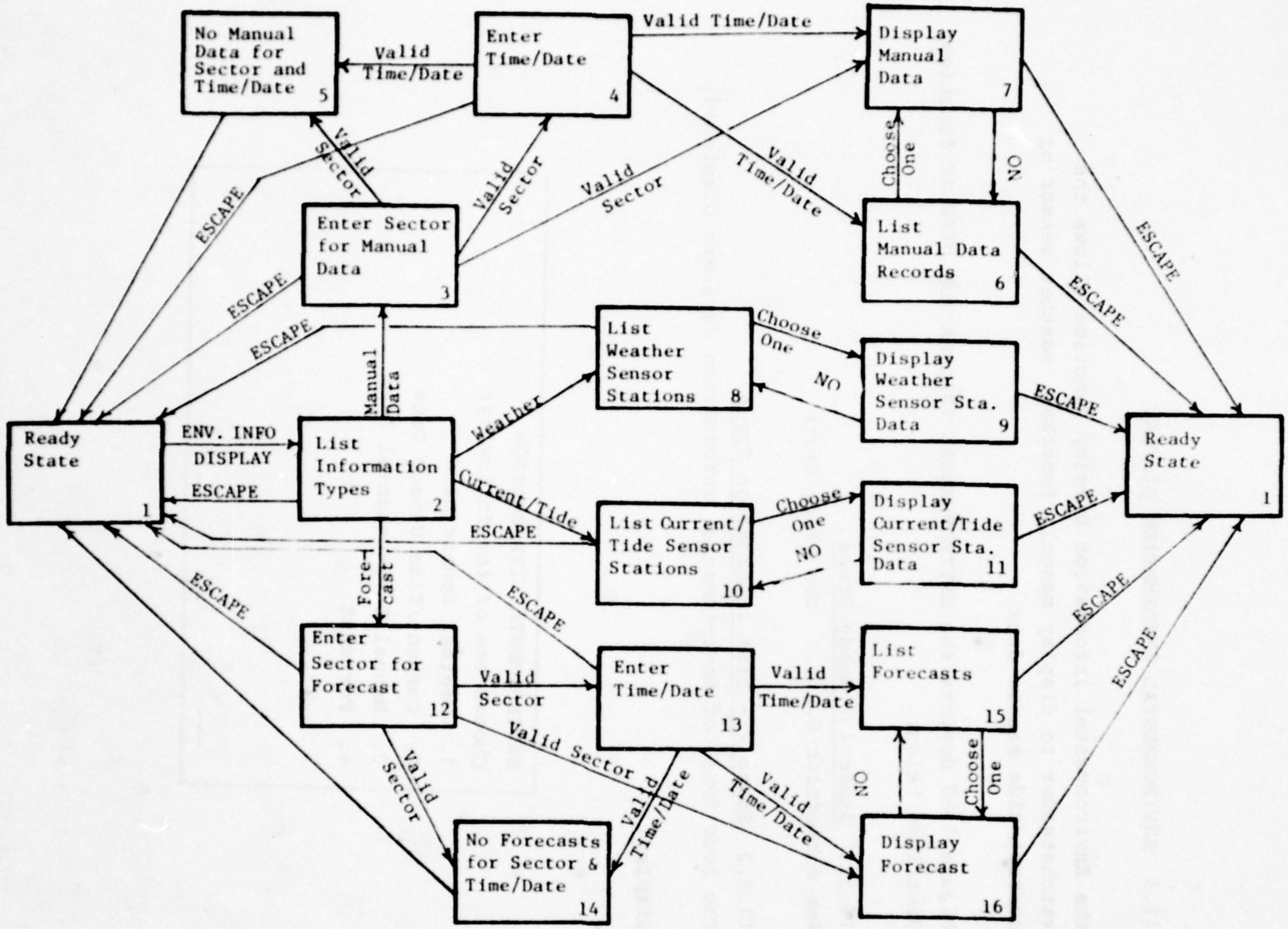


Figure 11-7. ENVIRONMENTAL INFORMATION DISPLAY

Actions: The watchstander will fill in the list entry number of the type of environmental information data desired, or he may enter an ESCAPE. If an illegal response is entered, the system will clear the entry, display INVALID RESPONSE, and await a new entry.

Entered From	When
1	ENVIRONMENTAL INFO pressed

Exit To	When
8	List entry number 1 selected
10	List entry number 2 selected
3	List entry number 3 selected
12	List entry number 4 selected
1	ESCAPE

11.3.3 <u>State 3 - Enter Sector for Manual Environmental Data</u>

See subsection 11.1.2.2 of the Modify Manual Environmental Data function.

Entered From	When
2	List entry number 3 selected

Exit To	When
5	Record does not exist
4	Valid sector entered
7	One record exists
1	ESCAPE

11.3.4 <u>State 4 - Enter Time/Date for Manual Environmental Data</u>

See subsection 11.1.2.3 of the Modify Manual Environmental Data function.

Entered From	When
3	Valid sector entered

Exit To	When
5	No record exists
6	More than one record exists
7	One record exists
1	ESCAPE

11.3.5 State 5 - No Manual Environmental Data for Sector and Time/Date

See subsection 11.1.2.4 of the Modify Manual Environmental Data function.

Entered From	When
3 or 4	No record exists

Exit To	When
1	Automatic

11.3.6 State 6 - List Manual Environmental Data Records

A list of all the environmental information records corresponding to the sector designation specified is displayed.

Display:

```
ENVIRONMENTAL INFORMATION
Choose one of the following Manual Environmental
Information Records:
      Time/Date         Latitude        Longitude
1.    hh:mm/mm-dd-yy dd°mm'ss"       ddd°mm'ss"
2.        .                .               .
.         .                .               .
.         .                .               .
.         .                .               .
n.        .                .               .
   ____
```

Actions: The watchstander will fill in the list entry number of the record desired, or he may enter an ESCAPE. If an illegal response is entered, the system will clear the entry, display INVALID RESPONSE, and await a new entry.

Entered From	When
4	More than one record exists
7	NO

Exit To	When
7	Valid list entry number entered
4	One record exists
1	ESCAPE

11.3.7 State 7 - Display Manual Environmental Data

The environmental data record specified is displayed.

Display:

```
ENVIRONMENTAL INFORMATION
MANUAL REPORT
Source:
Time/Date Entered:  hh:mm:ss/mm-dd-yy
Sectors Where Valid:
Coordinates:  LAT dd°mm'ss"
Keywords:
Text:



Press NO to display record list
```

Actions: The watchstander may press the NO to select another manual record or he may enter an ESCAPE.

Entered From	When
4	One record exists
6	Record selected
3	One record exists

Exit To	When
6	NO
1	ESCAPE

11.3.8 State 8 - List Weather Sensor Stations

All weather sensor stations are displayed.

Display:

```
ENVIRONMENTAL INFORMATION
Choose one of the following Weather Stations:
    STATION             SECTOR         COORDINATES
1.  designation_1       sector_1       coordinates_1
2.  designation_2       sector_2       coordinates_2
.                       .              .
.                       .              .
.                       .              .
n.  designation_n       sector_n       coordinates_n

___
```

Actions: The watchstander will fill in the list entry number desired, or he may enter an ESCAPE. If an illegal response is entered, the system will clear the entry, display INVALID RESPONSE, and await a new entry.

Entered From	When
2	List entry number 1 selected
9	NO

Exit To	When
9	Valid list entry number entered
1	ESCAPE

11.3.9 State 9 - Display Weather Sensor Station Data

The weather sensor station data specified is displayed. While in this state the displayed information is updated at the rate it is currently being received from the sensor station.

Display:

```
ENVIRONMENTAL INFORMATION
WEATHER SENSOR DATA
STATION:  designation
LOCATION:  LAT dd°mm'ss"  LONG ddd°mm'ss"
TEMPERATURE:  fff°F   CCC°C
VISIBILITY (MILES):
PRECIPITATION RATE (INCHES/HOUR):
WIND DIRECTION:  ddd°
WIND SPEED (KNOTS):

Press NO to display station list
```

Actions: The watchstander may press the NO to select another weather station, or he may enter an ESCAPE.

Entered From	When
8	Weather station selected

Exit To	When
8	NO
1	ESCAPE

11.3.10 State 10 - List Current/Tide Sensor Stations

All current/tide sensor stations are displayed.

Display:

```
ENVIRONMENTAL INFORMATION
Choose one of the following Current/Tide
Sensor Stations:
     STATION          LATITUDE        LONGITUDE
1.   designation      dd°mm'ss"       ddd°mm'ss"
2.      .                 .                .
.       .                 .                .
.       .                 .                .
.       .                 .                .
n.      .                 .                .

_____
```

Actions: The watchstander will fill in the list entry number desired, or he may enter an ESCAPE. If an illegal response is entered, the system will clear the entry, display INVALID RESPONSE, and await a new entry.

Entered From	When
2	Current/tide data selected
11	NO

Exit To	When
11	Valid list entry number entered
1	ESCAPE

11.3.11 State 11 - Display Current/Tide Sensor Station Data
The current/tide sensor station data specified is displayed. While in this state, the displayed information is updated at the same rate it is currently being received from the sensor station.

Display:

```
ENVIRONMENTAL INFORMATION
CURRENT/TIDE SENSOR DATA
STATION:  designation
LOCATION:  LAT dd°mm'ss" LONG ddd°mm'ss"
CURRENT DIRECTION:   ddd°
CURRENT SPEED (KNOTS):   ss
RELATIVE TIDE LEVEL (FEET ABOVE MLLW):  ff

Press NO to display station list
```

Actions: The watchstander will press the NO to select another current/tide sensor station, or he may enter an ESCAPE.

Entered From	When
10	Current/tide station selected

Exit To	When
10	NO
1	ESCAPE

11.3.12 State 12 - Enter Sector for Forecast

See subsection 11.1.2.2 of the Modify Manual Environmental Data function.

Entered From	When
2	Forecast data selected

Exit To	When
13	Valid sector entered
14	No record exists
16	One record exists
1	ESCAPE

11.3.13 State 13 - Enter Time/Date for Forecast

See subsection 11.1.2.3 of the Modify Manual Environmental Data function.

Entered From	When
12	Valid sector entered

Exit To	When
14	No record exists
16	One record exists
15	More than one record exists
1	ESCAPE

11.3.14 State 14 - No Forecast for Sector and Time/Date

The watchstander is notified that there are no forecast records for the sector and time/date specified.

Display:

```
ENVIRONMENTAL INFORMATION
No Forecast for Specified Parameters
```

Actions: None

Entered From	When
12	No record exists
13	No record exists

Exit To	When
1	Automatic

11.3.15 State 15 - List Forecasts

See subsection 11.1.2.5 of the Modify Manual Environmental Data function.

Entered From	When
13	More than one record
16	Another record desired

Exit To	When
16	Valid list entry number entered
1	ESCAPE

11.3.16 State 16 - Display Forecast

The forecast data record specified is displayed.

Display:

```
ENVIRONMENTAL INFORMATION
FORECAST
Source:
Sectors Covered:
Entered:  hh:mm/mm-dd-yy
Valid From:  hh:mm/mm-dd-yy
Valid Until:  hh:mm/mm-dd-yy
Text:


Press NO to display record list
```

Actions: The watchstander will press the NO to select another forecast data record, or he may enter an ESCAPE.

Entered From	When
13	One record exists
15	Record selected
12	One record exists

Exit To	When
15	NO
1	ESCAPE

12 SIMULATION FUNCTIONS

The simulation functions are used for training watchstanders, and for exercising and checking out the system before actual sensors are installed. The simulation capability is limited to simulating the information received from sensors and allowing the watchstanders to make entries on simulated vessels without affecting the credibility of the real data base being used by the operational VTS. Simulated sensor information and any simulated data base information will be stored on a mass memory device, and data will be read from the memory to simulate real-time.

Simulations will be invoked by the Watch Supervisor who will control simulated action and designate which watchstander stations will be receiving the simulated data in lieu of the real data. Watch Supervisor control of the simulation is provided by use of the following six commands:

(1) ENTER SIMULATION
(2) MODIFY SIMULATION
(3) DELETE SIMULATION
(4) INITIALIZE SIMULATION
(5) START SIMULATION
(6) STOP SIMULATION

The first three commands are used to enter, modify or delete a particular scenario record (see subsection 12.1) and the last three are used to initialize, start and stop the simulation playback (see subsection 12.6).

12.1 SCENARIO RECORD

Collectively, all the stored information for a particular simulation is termed a scenario record. It consists of six major headings (i.e., Scenario Name, Artificial Vessel List, Live Vessel List, Simulated Vessel File, Simulated Passage File, and Sensor Data) which are described in detail in the following subsections.

The scenario record form (see Figure 12-1) can accommodate one entry in the Artificial Vessel List and one entry in the Live Vessel List. Each time an entry is made at the end of either list, the list will be expanded to accept another entry; however, the sum of the number of vessel entries in both lists may not exceed 100. The Simulated Vessel and Passage Files can also accommodate one name each. When the Watch Supervisor enters a name, the record is expanded to provide space for all the data in a standard vessel or passage record.

12.1.1 Scenario Name

This name is an alphanumeric identifier (maximum of 25 characters) which is specified by the Watch Supervisor during the ENTER SIMULATION function.

12.1.2 Artificial Vessel List

Each vessel entry consists of a vessel name, which may be left blank, and up to 25 vessel movements. The vessel movement information includes:

SIMULATION FUNCTION NAME

Scenario Name:

Artificial Vessel List
    Vessel Name:

Live Vessel List
    Vessel Name:
    Start Time: (min:sec)

    Stop Time: (min:sec)

Simulated Vessel File
    Vessel Name:

Simulated Passage File
    Vessel Name:

Sensor Data

Press NEXT PAGE

Figure 12-1. Scenario Record Form

● Vessel Route

- a route segment name in level 1,2, or 3 areas;

- a pair of coordinates in level 4 or 5 areas (each pair of coordinates may be specified by typing latitude and longitude or by using the SET function on the map display).

● Vessel Timing - the elapsed time (min:sec) from the start of the scenario when the vessel is at the beginning of the route segment or coordinate specified.

● Vessel Motion Characteristics - the rate of change of the bearing and the speed as the vessel moves along the route segment or between the pair of coordinates.

12.1.3 Live Vessel List

Each vessel entry consists of:

● Vessel Name - the system will fill in the name, if identified, after the vessel is hooked (see subsection 12.2, Entering and Modifying Scenario Data). If the vessel is unidentified when hooked, the name entry will be blank;

● Start Time - the elapsed time (min:sec) from the start of the scenario when the recording of the vessel path is begun;

● Stop Time - the elapsed time (min:sec) from the start of the scenario until the recording of the vessel path is terminated.

The actual vessel path is recorded by the system during the ENTER SIMULATION function.

12.1.4 Simulated Vessel File

The records in the Simulated Vessel File have the same format as the vessel records in the Vessel File (see Section 7, Figure 7-1, the Vessel Record).

When a vessel is hooked by the Watch Supervisor during ENTER SIMULATION, a copy of the vessel record is added to the Simulated Vessel File. If any changes are made to the vessel record in the Vessel File after the Watch Supervisor has hooked the vessel, these changes will not appear on the scenario copy. The Simulated Vessel File will also include all the vessel records entered by the Watch Supervisor for artificial vessels.

During playback the Watch Supervisor may choose to preload the Simulated Vessel File with these records or to allow the trainee to make entries in the Simulated Vessel File.

12.1.5 Simulated Passage File

The records in the Simulated Passage File have the same format as the passage records in the Passage File (See Section 8, Figure 8-1, the Passage Record).

When a vessel is hooked by the Watch Supervisor during ENTER SIMULATION, a copy of the passage record for the vessel hooked is added to the Simulated Passage File. If any changes are made to the passage record in the Passage File after the Watch Supervisor has hooked the vessel, these changes will not appear in the scenario copy. There is one exception. The status and the corresponding anchorage, pier or location information will be the information stored in the Passage File at the start of the scenario recording (time 00:00) rather than the information stored in the Passage File at the time the vessel is hooked.

During playback the Watch Supervisor may choose to preload the Simulated Passage File with these records or to allow the trainee to make entries in the Simulated Passage File.

12.1.6 Sensor Data

The format of the weather and tide sensor data is shown in Figure 12-2. The average value of all data collected by each weather and tide sensor, updated at ten minute intervals from the beginning of a scenario, will be stored in this format. The Watch Supervisor may edit any of these values during MODIFY SIMULATION.

During playback the displayed values will be varied randomly to simulate nature. However, the mean value over each ten minute interval will be equal to the stored value.

Station Designation: ____________

Location: ____________

TIME	TEMP	VIS	PREC	WIND DIR	WIND SPEED
00:00	20	GD	.1	NE	1.2
10:00					
20:00					
.					
.					
.					
180:00					

Station Designation: ____________

Location: ____________

TIME	CURRENT DIR	CURRENT SP	TIDE LEVEL
00:00			
10:00			
20:00			
.			
.			
.			
180:00			

Figure 12-2. Format of Weather and Tide Sensor Data

12.2 ENTERING AND MODIFYING DATA IN THE SCENARIO RECORD

The Watch Supervisor actions required for entering and modifying data within each of the six major headings of a scenario record (see subsection 12.1) are discussed in the following subsections.

12.2.1 Scenario Name

The Watch Supervisor enters an alphanumeric string of less than or equal to 25 characters for a scenario record name. During ENTER SIMULATION, the name entered must be unique since it may later be used to identify a particular scenario record in the MODIFY SIMULATION, DELETE SIMULATION or INITIALIZE SIMULATION commands. The name may be changed during MODIFY SIMULATION provided the modified name is also unique.

12.2.2 Artificial Vessel List

To add a vessel:

- The Supervisor moves the cursor to the line under the Vessel Name heading at the end of the Artificial Vessel List, fills in a vessel name or asterisk (*), if the vessel is to be unidentified in the scenario, and presses carriage RETURN.

- The Artificial Vessel List will be expanded to:
  Previous end of list

```
Vessel Name:
   Name filled in by supervisor
   Route  Timing  Bearing Change Speed Change

Vessel Name:
```

Current end of list

- The Supervisor then fills in up to 25 lines of vessel movements.

To modify a vessel entry:

- The Supervisor moves the cursor to the beginning of the line to be modified and types over the entry.

To delete an entry:

- To delete a single vessel movement, the Supervisor moves the cursor to the beginning of the line and presses DELETE LINE.

- To delete a vessel from the list, the Supervisor moves the cursor to the vessel name and presses DELETE LINE.

12.2.3 <u>Live Vessel List</u>

To add a vessel:

- The Supervisor hooks a vessel on the map display. After the vessel is hooked, the vessel name will appear on the Live Vessel List. If the vessel is unidentified the name entry will be an asterisk (*). The cursor will be positioned at the beginning of the Start Time entry for Watch Supervisor entry. Default Start Time is 00:00 and default Stop Time is 180:00 (i.e., 3 hours is the maximum length of a scenario).

- The actual recording will not begin until after ENTER is pressed at the end of the ENTER SIMULATION or MODIFY SIMULATION function.

To delete a vessel:

- The vessel may be deleted by clearing the hook if no other hooks or set functions have been performed since the vessel was hooked.

- The vessel may also be deleted by placing the cursor at the beginning of the name entry and pressing DELETE LINE.

An entry in the Live Vessel List may not be modified.

12.2.4 Simulated Vessel File and Passage File

Adding, modifying and deleting entries in this file correspond to adding, modifying or deleting entries in the Vessel or Passage File (see Section 7, Vessel File Functions, and Section 8, Passage File Functions).

12.2.5 Sensor Data

Data may not be added or deleted in this file by the Watch Supervisor. All sensor data is recorded automatically after ENTER is pressed at the end of the ENTER SIMULATION command.

During the MODIFY SIMULATION command, the average value of all data collected by the weather and tide sensors for each ten minute interval of the scenario is displayed. Any part of this data may be modified by the Supervisor.

12.3 ENTER SIMULATION

The Enter Simulation command allows the Watch Supervisor to enter a scenario record for simulation playback. In creating the record, the Supervisor will specify the paths of the simulated vessels. This may be accomplished in two ways: (1) by recording in the scenario record the paths of designated vessels in the live VTS, as contained in the operational portions of the system data base, and/or (2) by generating artificial vessels and vessel maneuvers. The first technique will provide scenarios which realistically depict actual traffic patterns since they are based on actual vessel movements, while the second technique allows the Supervisor to set up situations which do not normally occur (e.g., accidents) for training purposes.

Figure 12-3 depicts the ENTER SIMULATION command described below.

12.3.1 State 1 - Ready State

See subsection 6.2.1.1, the Ready State.

12.3.2 State 2 - Identify Scenario

The system prompts the Watch Supervisor to fill in the scenario name desired.

Display:

```
ENTER SIMULATION

        Fill in name for scenario:

              Name

              ___
```

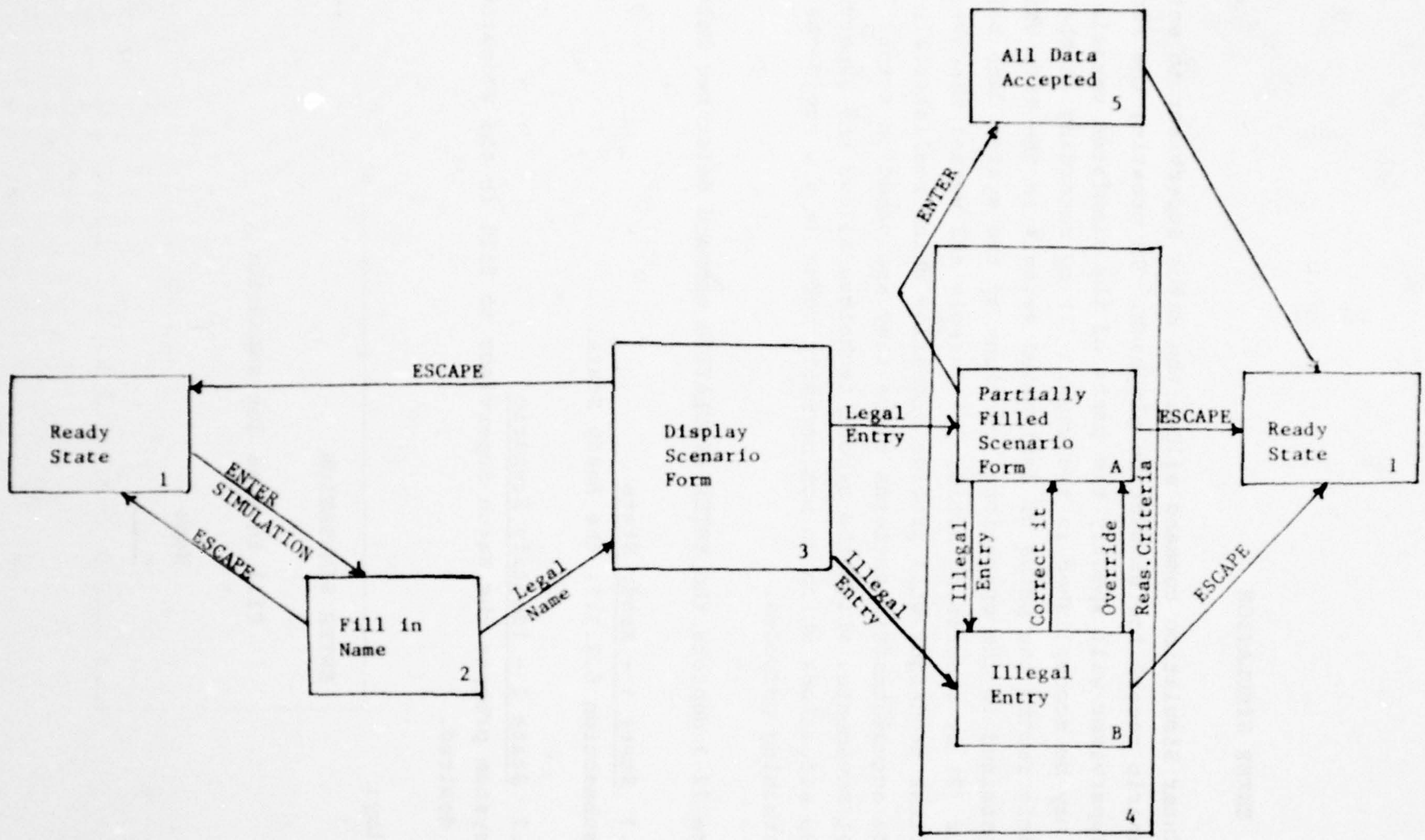


Figure 12-3. ENTER SIMULATION

Actions: The Watch Supervisor will fill in a unique scenario name, or he may enter an ESCAPE. If an illegal name is entered (e.g., a duplicate scenario name or a name longer than 25 characters), the system clears the entry, displays INVALID RESPONSE, and awaits a new entry.

Entered From	When
1	ENTER SIMULATION

Exit To	When
3	Valid name entered
1	ESCAPE

12.3.3 State 3 - Display Scenario Record Form

The blank scenario record form is displayed.

Display: See Figure 12-1, the Scenario Record.

Actions: The Watch Supervisor will fill in the scenario record form, conforming with subsection 12.2, or he may enter an ESCAPE.

Entered From	When
2	Legal name entered

Exit To	When
4A	Legal response entered
4B	Illegal response entered
1	ESCAPE

12.3.4 Partially Filled Scenario Form

- Substate 4A

  The partially filled scenario record form is displayed.

Display: See Figure 12-1, the Scenario Record.

Actions: The Watch Supervisor will fill in the form, conforming with Subsection 12.2, and press ENTER, or he may enter an ESCAPE.

Entered From	When
3	Legal Response entered
4B	Illegal entry corrected or reasonability criteria overridden

Exit To	When
5	ENTER
1	ESCAPE

- Substate 4B

The illegal entry on the scenario record form flashes on the display to alert the Watch Supervisor.

Display: See Figure 12-1, the Scenario Record.

Actions: The Watch Supervisor will correct the flashing illegal entry, possibly make an illegal correction, move the cursor through the entry to override the reasonability criterion, or he may enter an ESCAPE.

Entered From	When
4A	Illegal response entered

Exit To	When
4A	Illegal entry corrected or reasonability criterion overridden
4B	Illegal correction entered
1	ESCAPE

12.3.5 State 5 - All Data Accepted

The Watch Supervisor is notified that the scenario record data has been accepted and the recording has started. (The recording is started only if a vessel has been added to the Live Vessel List).

Display:

Scenario data accepted. Recording started.

Actions: If a vessel has been added to the Live Vessel List, the system will return to the ready state after all vessel movements and sensor data have been recorded.

Note: While the data is being recorded, the station is in a pseudo ready state (i.e., any command which is legal in ready state is legal in this state, except simulation commands).

Entered From	When
4A	ENTER

Exit To	When
1	Recording finished
1	Data Accepted

12.4 MODIFY SIMULATION

The Modify Simulation command allows the Watch Supervisor to modify a particular scenario record, specified by its scenario name, in the data base. The record may be edited to change vessel tracks or timing (i.e., additions or deletions), sensor data, and/or the simulated passage and vessel file data.

Figure 12-4 depicts the MODIFY SIMULATION command described below.

12.4.1 State 1 - Ready State

See subsection 6.2.1.1, the Ready State.

12.4.2 State 2 - Identify Scenario

This state corresponds to Subsection 12.3.2 of the Enter Simulation command except that an illegal name is a scenario that has not been entered into the data base rather than a duplication.

12.4.3 State 3 - Display Scenario Record

The scenario record specified is displayed.

Display: See Figure 12-1, the Scenario Record.

Actions: The Watch Supervisor will modify the scenario record specified, conforming with subsection 12.2, or he may enter an ESCAPE.

Entered From	When
2	Legal name entered

Exit To	When
4A	Legal response entered
4B	Illegal response entered
1	ESCAPE

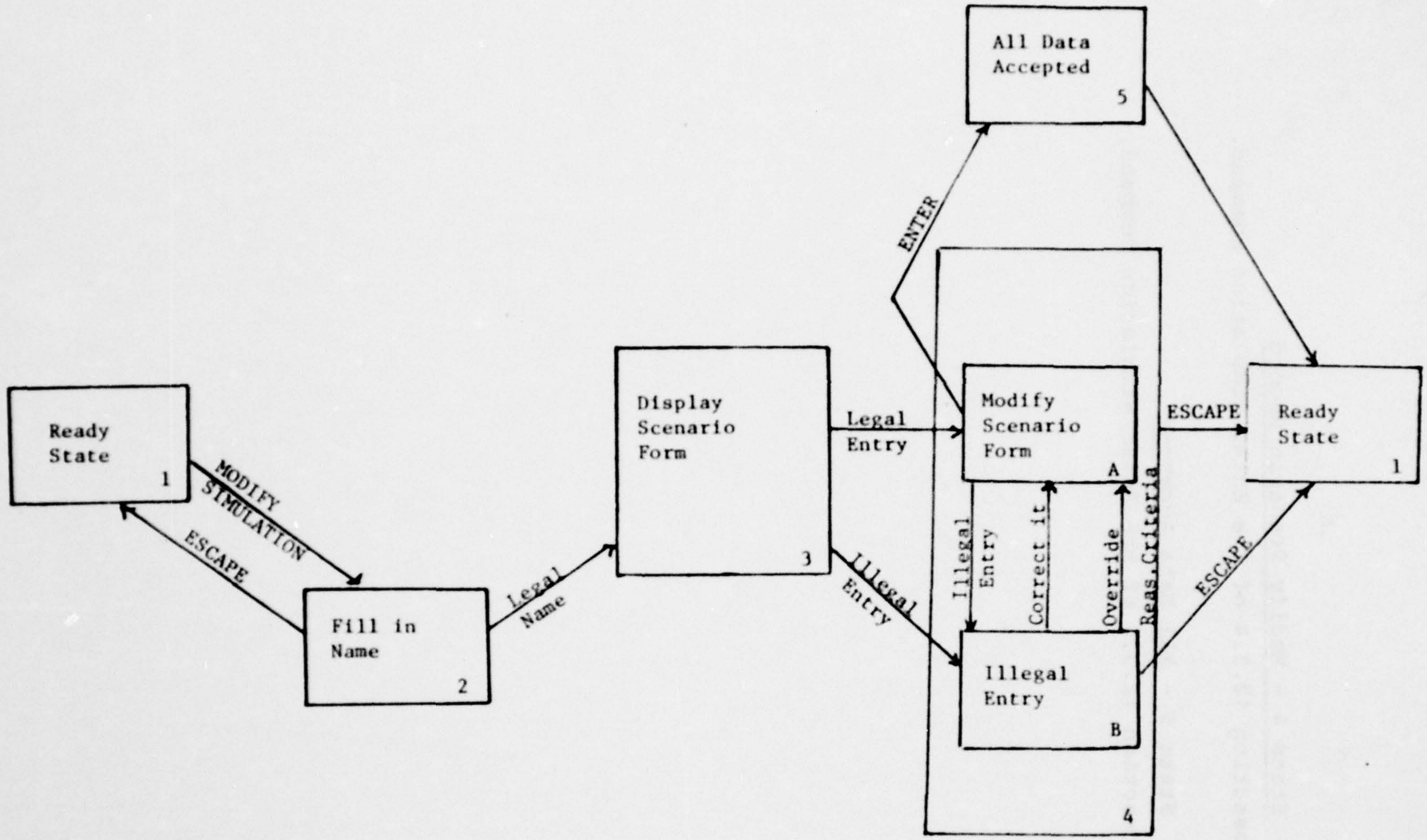


Figure 12-4. MODIFY SIMULATION

12.4.4 State 4 - Modify Scenario Record

See subsection 12.3.4 of the Enter Simulation command.

12.4.5 State 5 - All Data Accepted

See subsection 12.3.5 of the Enter Simulation command.

12.5 DELETE SIMULATION

The Delete Simulation command allows the Watch Supervisor to delete a particular scenario record, specified by scenario name, from the data base.

Figure 12-5 depicts the DELETE SIMULATION command described below.

12.5.1 State 1 - Ready State

See subsection 6.2.1.1, the Ready State.

12.5.2 State 2 - Identify Scenario

See subsection 12.4.2 of the Modify Simulation command.

12.5.3 State 3 - Display Scenario Record

The scenario record specified is displayed.

Display: See Figure 12-1, the Scenario Record. (At the bottom of the record, the system asks, "Do you want to delete this record?")

Actions: The Watch Supervisor will press YES if he wants to delete the record displayed, NO if he wants to identify another record, or he may enter an ESCAPE.

Entered From	When
2	Legal name entered

Exit To	When
4	YES pressed
2	NO pressed
1	ESCAPE

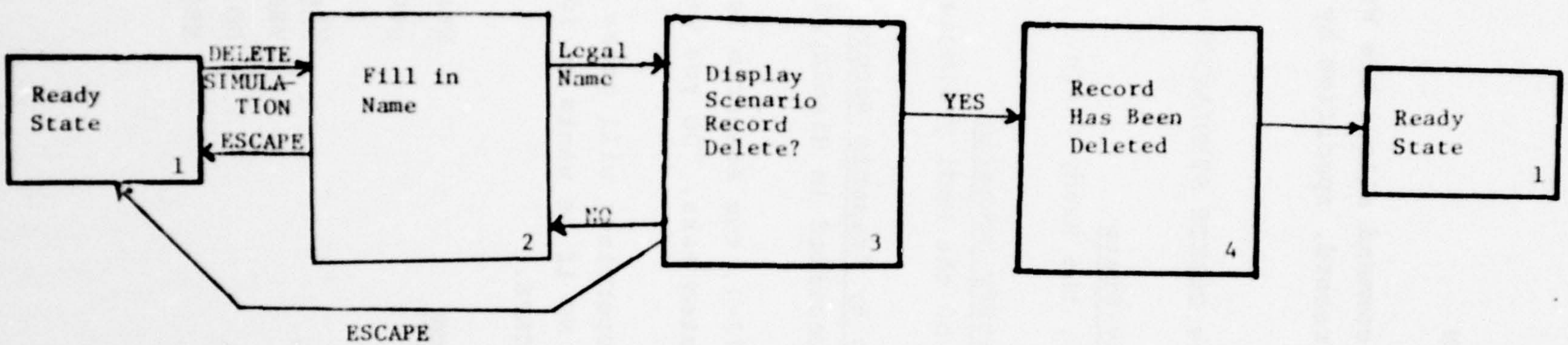


Figure 12-5. DELETE SIMULATION

12.5.4 State 4 - Record Deleted

The Watch Supervisor is notified that the scenario record specified has been deleted.

Display:

The scenario record has been deleted.

Actions: None

Entered From	When
3	YES pressed

Exit To	When
1	Automatic

12.6 SIMULATION PLAYBACK

The simulation playback involves three Watch Supervisor commands - Initialize Simulation, Start Simulation, and Stop Simulation. After INITIALIZE SIMULATION, the system prompts the Supervisor for the scenario name, the number of the station which is to receive the simulated data and whether the Simulated Passage and Vessel Files should be loaded. START SIMULATION causes the system to request the starting time and playback speed. After these values have been entered, the scenario will begin. The playback will then continue until the end of the scenario or until the Supervisor enters STOP SIMULATION.

During the simulation playback, the Watch Supervisor will have the following options:

- To start the scenario action at the beginning or at any specified time into the scenario.

- To play back the scenario at normal, 6 times normal, or 60 times normal speed.

- To temporarily freeze scenario action during playback, and resume it at will at any of the above speeds.

During the playback all other functions of the system will function as if the simulated data were real except that any hazard alerts generated by simulated vessels will be displayed only on the watchstander stations designated for the simulation and, with special notation, on the Watch Supervisor station.

Figure 12-6 depicts the Simulation Playback described below.

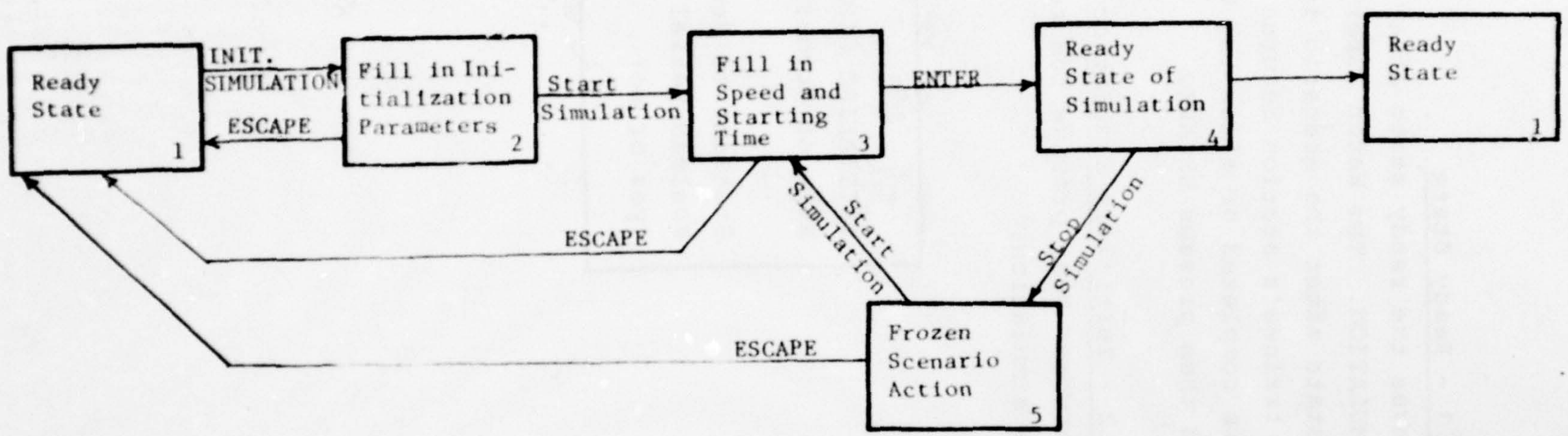
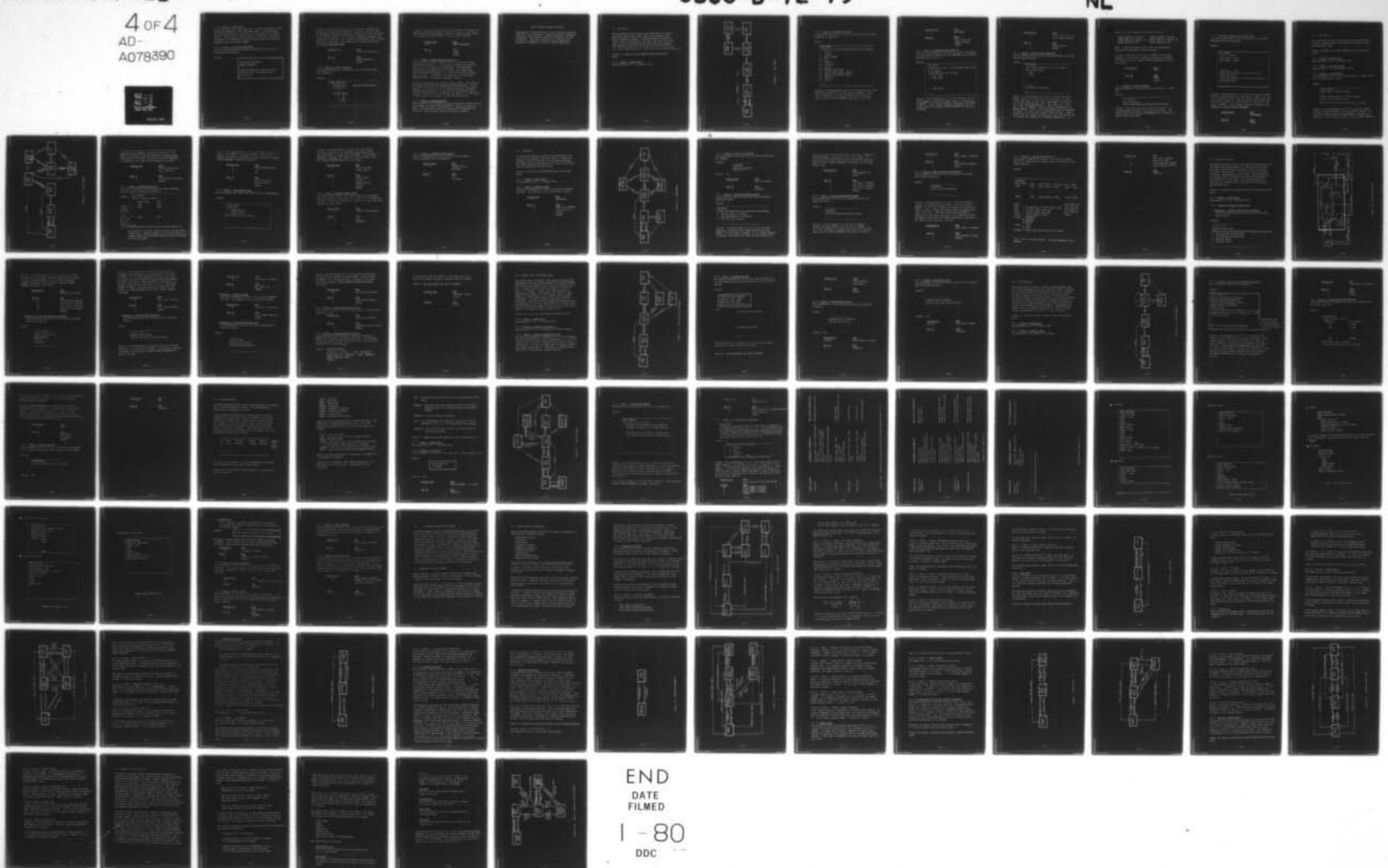


Figure 12-6 SIMULATION PLAYBACK (Watch Supervisor's Actions Only)

AD-A078 390 INTERNATIONAL COMPUTING CO BETHESDA MD F/G 15/5
VESSEL TRAFFIC SERVICES PROCESSING/DISPLAY SUBSYSTEM SOFTWARE R--ETC(U)
SEP 79 C C HENSON , R S GRAHAM , B A MCINTOSH DOT-CG-81-78-1833

UNCLASSIFIED USCG-D-72-79 NL

4 OF 4
AD-
A078390



END
DATE
FILMED
1-80
DDC

12.6.1 State 1 - Ready State

The system leaves the ready state afte the Watch Supervisor enters INITIALIZE SIMULATION. The Watch Supervisor's station returns to the ready state after the scenario is started at the trainee's station. The trainee's station returns to the ready state after the scenario is completed or after the Watch Supervisor stops the simulation and then presses ESCAPE.

12.6.2 State 2 - Initialize Simulation

The Watch Supervisor must provide the requested information to initialize the simulation.

Display:

```
INITIALIZE SIMULATION
Name of Scenario:
    -
Stations to Receive Simulation Data:
Preload Vessel and Passage Files:
(yes or no)
```

Actions: The Watch Supervisor will fill in the scenario name, the trainee stations to receive the simulation, and YES OR NO in response to the preload question. He may also enter an ESCAPE or an illegal response. If an illegal response is entered, the system will clear the entry, display the appropriate error message, and await a new entry. Upon completion, the Watch Supervisor will enter START SIMULATION.

Entered From	When
1	INITIALIZE SIMULATION

Exit To	When
3	START SIMULATION
1	ESCAPE

12.6.3 State 3 - Start Simulation

The default values for the starting time and playback speed are displayed.

Display:

```
START SIMULATION
   Starting Time:     (min:sec from beginning
   of scenario)
   _
   Playback Speed:
        1.  1X
        2.  6X
        3.  60X
```

Actions: The Watch Supervisor will press ENTER if the speed and time entries are satisfactory, change the speed or time entries (if desired) and press ENTER, or he may enter an ESCAPE.

Entered From	When
2 or 5	START SIMULATION

Exit To	When
4	ENTER
1	ESCAPE

12.6.4 State 4 - Ready State of Simulation

The system enters state 4 after the Watch Supervisor presses ENTER while in state 3. In this state, the Watch Supervisor's station is in an "effective" ready state. The Supervisor may perform any function which is legal in the ready state except INITIALIZE SIMULATION (i.e., only one simulation may be run at a time). In addition, the Supervisor may enter STOP SIMULATION which will take the system to state 5.

As soon as the Supervisor's station enters state 4, the scenario will begin playing at the designated trainee stations. If any function is active at one of the trainee stations, a SAVE will automatically be called. At the end of the playback or after the Watch Supervisor calls an ESCAPE from state 5, the designated trainee stations will return to their previous states.

12.6.5 State 5 - Stop Simulation

The displays at the designated trainee stations are frozen when the Watch Supervisor enters STOP SIMULATION. State 5 is exited to state 3 when the Watch Supervisor enters START SIMULATION and to state 1 when the Watch Supervisor enters an ESCAPE.

13 OTHER OPERATOR INVOKED FUNCTIONS

Some operator invoked functions in this chapter provide the capability for the system to compute and display requested information using operator specified parameters and file system data. Additional functions are included which designate or respond to a state of system operations.

13.1 KEY SEARCH

The Key Search function allows the watchstander to display qualifying search output data items after providing the search parameters desired. The watchstander specifies the record types to be searched, the data items which are to be used as keys, and the key values which must be satisfied. The system then searches the record type chosen and selects only those records whose key values meet the parameters specified.

Figure 13-1 depicts the KEY SEARCH function described below.

13.1.1 State 1 - Ready State

See subsection 6.2.1.1, the Ready State.

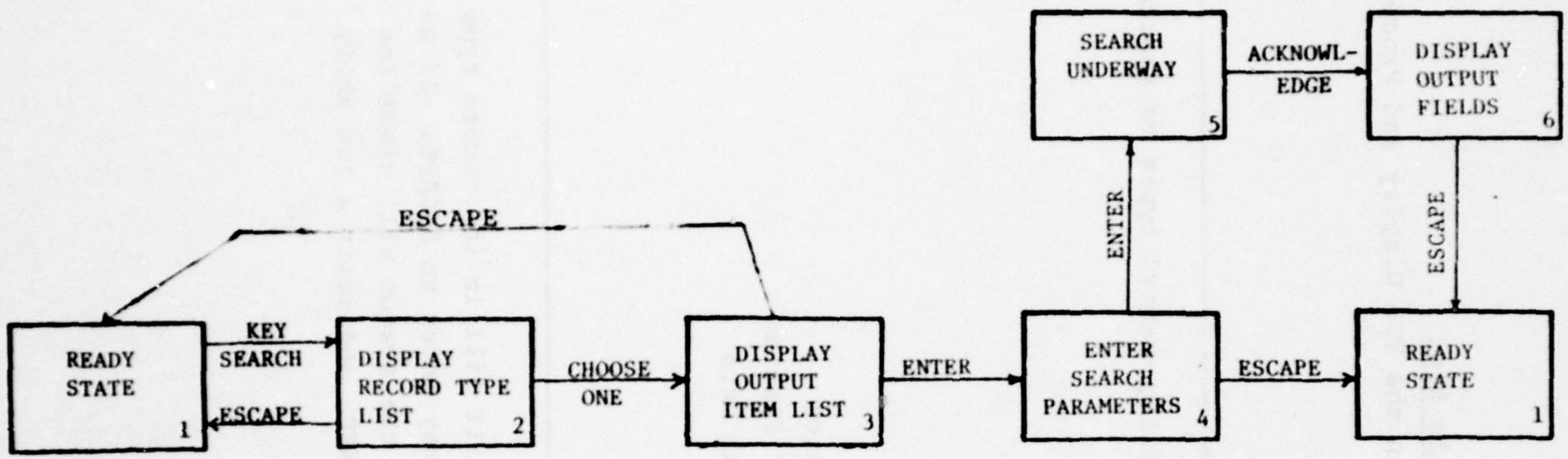


FIGURE 13-1. KEY SEARCH

13.1.2 State 2 - Display File List

A list of all record types in the VTS Display and Processing Subsystem is displayed.

Display:

```
KEY SEARCH
Choose one of the following record types to search:
1.  Vessel
2.  Passage
3.  Route Segment
4.  Cell
5.  Waypoint
6.  Dock/Pier
7.  Navaid
8.  Weather Sensor Station
9.  Current/Tide Sensor Station
10. Manual Environmental Data
11. Forecast
12. Notice

 ___
```

Actions: The watchstander will fill in the record type list entry number desired, or he may enter an ESCAPE. If an illegal response is entered, the system will clear the entry, display INVALID RESPONSE, and await a new entry.

Entered From	When
1	KEY SEARCH

Exit To	When
3	Valid list entry number entered
1	ESCAPE

13.1.3 State 3 - Display Output Item List

A list of the possible data items to be output is displayed. (The data items on display will be dependent on the record type selected in State 2.)

Display:

```
KEY SEARCH
Choose one or more of the following data items
to be output.
Press ENTER key when finished.
1.  Data Item_1
2.  Data Item_2
.   .
.   .
.   .
n.  Data Item_n

__
```

Actions: The watchstander will fill in the data item list entry number(s) desired and press ENTER, or he may enter an ESCAPE. If an illegal response is entered, the system clears the entry, displays INVALID RESPONSE and awaits a new entry.

Entered From	When
2	Valid record type list entry number entered

Exit To	When
4	ENTER pressed
1	ESCAPE

13.1.4 State 4 - Enter Search Parameters

The watchstander must enter the search parameters using the search keys on display.

Display:

```
KEY SEARCH
Enter Search parameters using the search
keys listed below:
1.  Key1
2.  Key2
.
.
.
n. keyn
Enter Search Parameters:

___
```

Action: The watchstander will fill in a query and press ENTER. Each key in the query must be related to a value of the same type (integer, real, alphanumeric) entered by one of the following operators: .EQ., .NE., .LT., .LE., .GT., .GE. An example of such a logical relationship is: VESSEL-LENGTH . GT.100. Such relationships may be connected by .AND or .OR, with .AND. having higher priority. Parentheses have the highest relational priority, and may be used to increase the readability of complex expressions. For

example, the two expressions below are identical:

VESSEL-LENGTH.GT.100.AND.	(VESSEL-LENGTH.GT.100.AND.
VESSEL-NAME.NE.'TITANTIC'.OR.	VESSEL-NAME.NE.'TITANIC').OR.
VESSEL-WEIGHT.GT.5000	VESSEL-WEIGHT.GT.5000

Note: A query may span multiple lines and alphanumeric constants are enclosed in quotation marks.

The watchstander may also enter an ESCAPE or an illegal response. If an illegal response is entered, the system will clear the entry, display INVALID RESPONSE, and await a new entry.

Entered From	When
3	ENTER

Exit To	When
5	ENTER
1	ESCAPE

13.1.5 State 5 - Search Underway

The watchstander is notified that the key search is underway.

Display:

```
KEY SEARCH
Search Underway
```

Actions: When the system has completed the search, the ACTION REQUIRED indicator light will be turned on. The watchstander will press the ACKNOWLEDGE key to display the search output data items.

13.1.6 State 6 - Display Output Data Items

The search output data items corresponding to the parameters specified are displayed.

Display:

```
KEY SEARCH
Search Completed
Data Item_1:  Value_1
Data Item_2:  Value_2
     .           .
     .           .
     .           .
Data Item_n:  Value_n
Press NEXT PAGE key to view data of next
qualified record.
Press PREV PAGE key to view data of previous
qualified record.
```

Actions: The watchstander will press NEXT PAGE to display the next qualified record or PREV PAGE to display the previous qualified record. When the watchstander reaches the end of the records, the value fields are blank and he may enter an ESCAPE. If an illegal response is entered, the system will display INVALID RESPONSE.

Entered From	When
5	ACKNOWLEDGE

Exit To	When
1	ESCAPE

13.2 LOCAL TRAFFIC

The Local Traffic function provides the watchstander with a list of vessels within a designated (or default) radius of a specified vessel.

Figure 13-2 depicts the LOCAL TRAFFIC function described below.

13.2.1 State 1 - Ready State

See subsection 6.2.1.1, the Ready State.

13.2.2 State 2 - Specify Vessel

See subsection 6.2.2, Specifying a Vessel.

13.2.3 State 3 - Enter Radius

The watchstander may enter the radius about the vessel which is to be searched for traffic.

Display:

```
LOCAL TRAFFIC
ENTER RADIUS (NAUTICAL MILES):_

___
PRESS CARRIAGE RETURN TO SPECIFY DEFAULT
RADIUS OF nn NAUTICAL MILES
```

Action: The watchstander will fill in a positive number and press carriage RETURN, or he may enter an ESCAPE. If no entry is made and the carriage RETURN is pressed, the system will use the default radius. If an illegal response

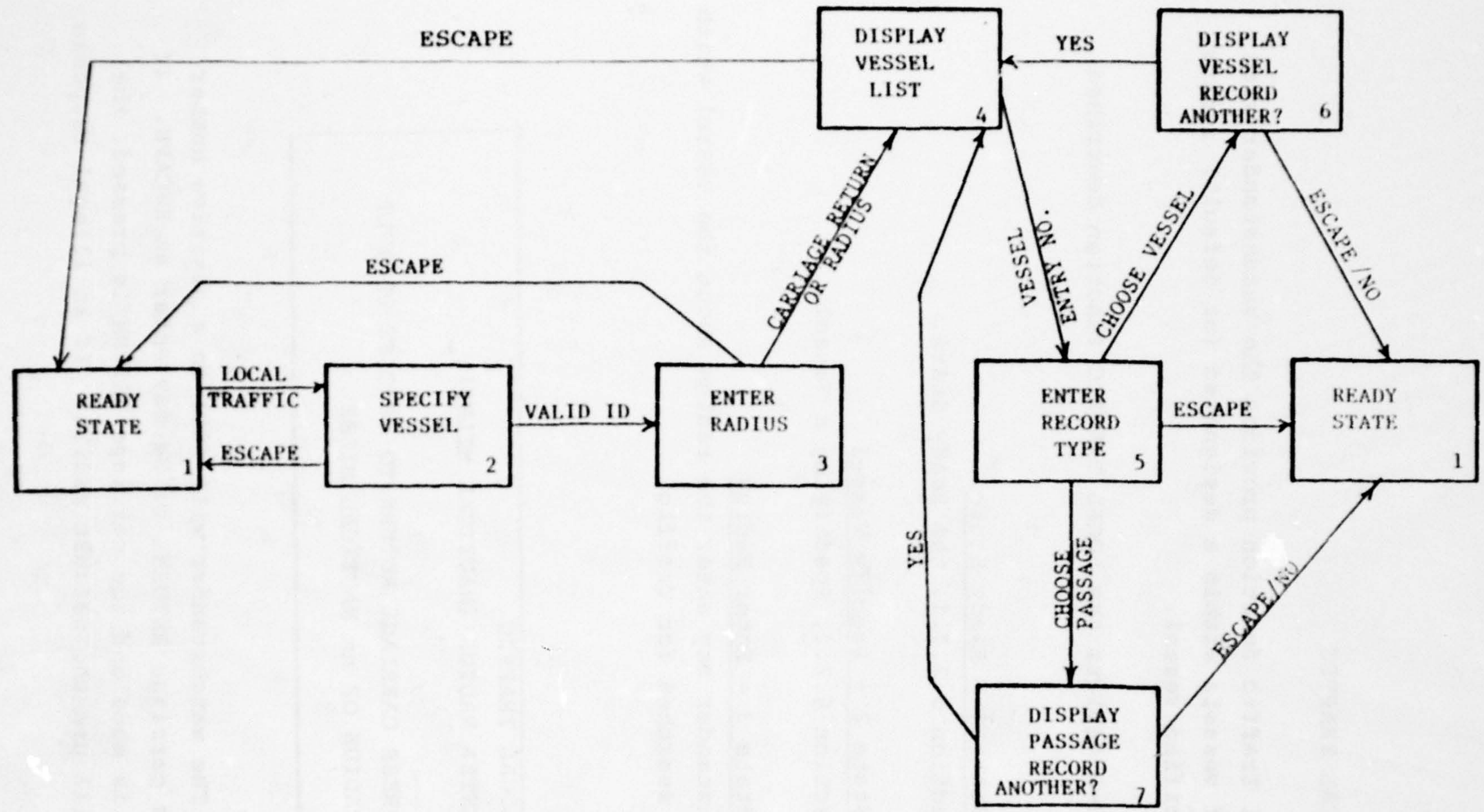


FIGURE 13-2. LOCAL TRAFFIC

is entered, the system will clear the entry, display the appropriate error message, and await a new entry. TOO LARGE is displayed if the entry exceeds the maximum legal value preset by the Watch Supervisor and INVALID RESPONSE is displayed if any other illegal response is entered.

Entered From	When
2	Existing Vessel passage identified

Exit To	When
4	Valid radius is entered
1	ESCAPE

13.2.4 State 4 - Display Vessel List

The list of identified vessels within the radius specified from the vessel designated is displayed.

Display:

LOCAL TRAFFIC
RADIUS IN NAUTICAL MILES IS nn

	VESSEL NAME	TYPE
1.	$name_1$	$type_1$
2.	$name_2$	$type_2$
.	.	.
.	.	.
.	.	.
N	$name_n$	$type_n$

___

If more vessels then will fit on screen then list may be scrolled up or down

The vessels are listed in order, with the closest vessel listed first. The data items on the list are dynamic, as vessels leaving the specified area are deleted and vessels entering are added.

Actions: The watchstander may fill in a vessel list entry number, press ENTER, or enter an ESCAPE. If an illegal response is entered, the system will clear the entry, display INVALID RESPONSE, and await a new entry.

Entered From	When
3	Valid radius entered
6	YES
7	YES

Exit To	When
5	Valid list entry number entered
1	ESCAPE

13.2.5 State 5 - Enter Record Type

The watchstander must select the record type to be displayed.

Display:

```
  LOCAL TRAFFIC
  RECORD TYPE
  1.  VESSEL RECORD
  2.  PASSAGE RECORD
SELECT RECORD TYPE TO DISPLAY:



  _
```

Actions: The watchstander will fill in 1 if he selects the vessel record or 2 if he selects the passage record and press ENTER, or he may enter an ESCAPE. If an illegal response is entered, the system will clear the entry, display INVALID RESPONSE and await a new entry.

Entered From	When
4	Valid list entry number typed

Exit To	When
6	Vessel record selected
7	Passage record selected
1	ESCAPE

13.2.6 State 6 - Display Vessel Record

This state corresponds to the Display Vessel function except that the operator is also asked if he would like to reidentify a vessel. If YES, the system goes to State 4; if NO, the system goes to the ready state.

Entered From	When
5	Vessel record selected

Exit To	When
4	YES
1	ESCAPE/NO

13.2.7 <u>State 7 - Display Passage Record</u>

State 7 corresponds to State 6 of this function except that the passage record is displayed.

Entered From	When
5	Passage record selected

Exit To	When
4	YES
1	ESCAPE/NO

13.3 ENCOUNTERS

The Encounters function provides the watchstander with a list of all vessels a specified vessel is expected to overtake, cross or meet within an indicated time span. The system computes and displays this list by using data from the passage and waterway files.

Figure 13-3 depicts the ENCOUNTERS function described below.

13.3.1 State 1 - Ready State

See subsection 6.2.1.1, the Ready State.

13.3.2 State 2 - Specify Vessel

This state corresponds to State 2 of the Modify Passage function. See subsection 6.2.2, Specifying a Vessel.

Entered From	When
1	ENCOUNTERS

Exit To	When
3	Vessel not underway
4	Valid vessel ID entered
1	ESCAPE

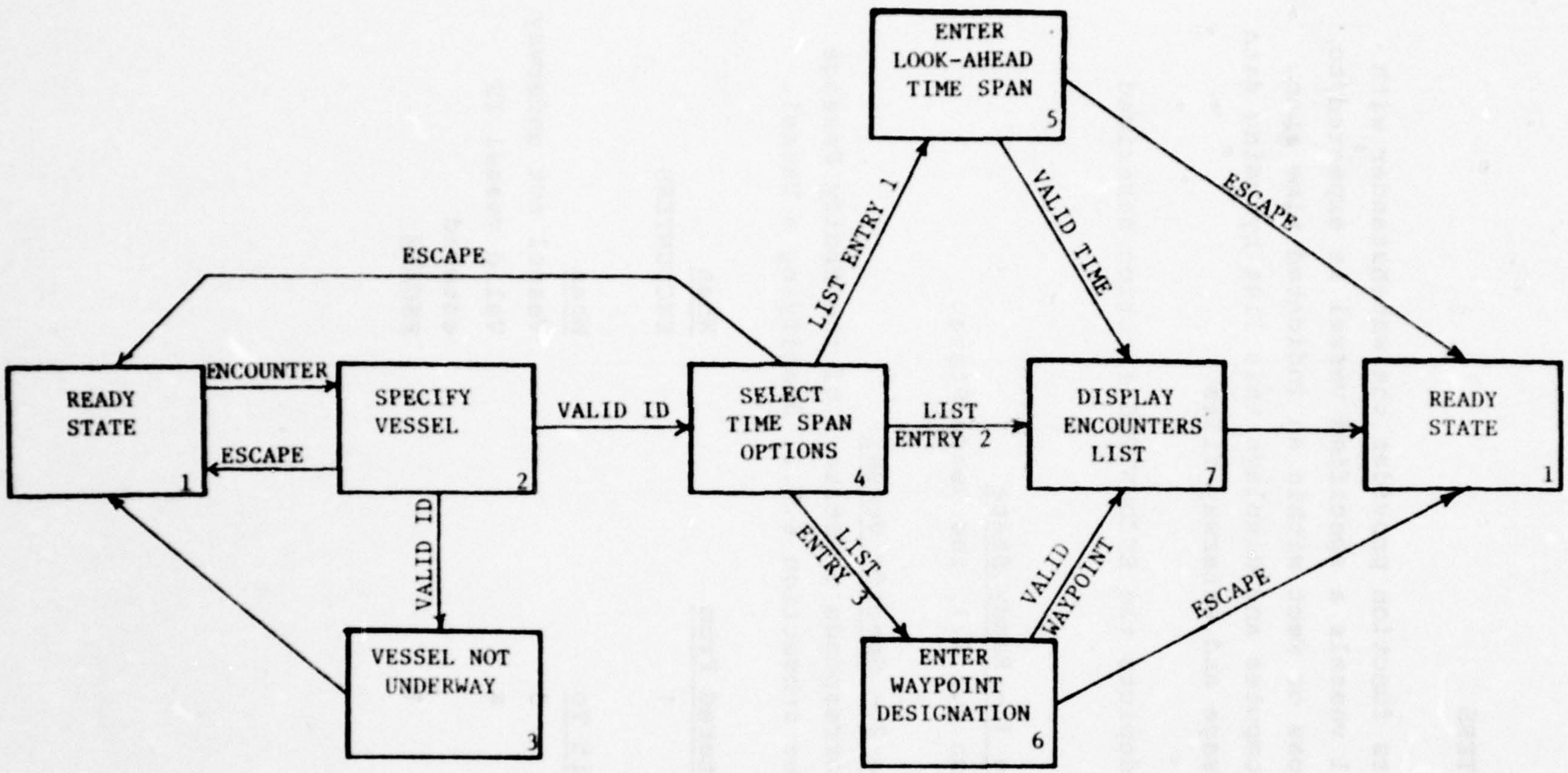


FIGURE 13-3. ENCOUNTERS

13.3.3 State 3 - Vessel Not Underway

The watchstander is notified that the vessel specified is not underway.

Display:

```
ENCOUNTERS
Vessel Not Underway
```

Actions: None

Entered From	When
2	Valid ID entered

Exit To	When
1	Automatic

13.3.4 State 4 - Select Time Span Options

The watchstander must enter the time span designation technique desired.

Display:

```
ENCOUNTERS
Choose Look-Ahead Time Span Specification Technique
1.  Specify Number of Minutes
2.  Use System Default (nn Minutes)
3.  USE time until waypoint

_
```

Actions: The watchstander will fill in the time span designation technique entry number desired and press ENTER, or he may enter an ESCAPE. If an illegal response is entered, the system will clear the entry,display the

appropriate error message and await a new entry. VESSEL NOT IN ROUTE PROGRAM is displayed if list entry number 3 is entered and the system has not been provided the time until next way point; INVALID RESPONSE is displayed for any other illegal entry.

Entered From	When
2	Valid underway ID entered

Exit To	When
5	List entry 1 entered
7	List entry 2 entered
6	List entry 3 entered
1	ESCAPE

13.3.5 State 5 - Enter Look-Ahead Time Span

The watchstander must enter the look-ahead span for the vessel specified.

Display:

ENCOUNTERS

Enter Look-Ahead Time Span (minutes):

_

Actions: The watchstander will fill in the number of minutes and press ENTER, or he may enter an ESCAPE. If an illegal response is entered, the system will clear the entry, display INVALID RESPONSE, and await a new entry.

Entered From	When
4	Entry number 1 selected

Exit To	When
7	Valid minutes entered
1	ESCAPE

13.3.6 State 6 - Specify Waypoint Designation

The watchstander must enter the next waypoint designation of the vessel specified.

Display:

```
ENCOUNTERS
Enter Waypoint Designation

_
```

Actions: The watchstander will fill in the next waypoint designation desired and press ENTER, or he may enter an ESCAPE. If an illegal response is entered, the system will clear the entry, display the appropriate error message and await a new entry. WAYPOINT NOT ON VESSEL SCHEDULE is displayed if the vessel specified is not scheduled to pass the waypoint designated and INVALID RESPONSE is displayed if any other illegal response is entered.

Entered From	When
4	Entry number 3 selected

Exit To	When
7	Valid waypoint entered
1	ESCAPE

13.3.7 State 7 - Display Encounter List

The system calculates and displays all vessels the vessel specified is expected to overtake, cross or meet within the given time span.

Display:

ENCOUNTERS

Vessel Name	Type	Cargo	Length	Situation	Lane	Time
$name_1$	$type_1$	$cargo_1$	$length_1$	$s\text{-}code_1$	$l\text{-}code_1$	hh:mm
.	.	.	.	.	.	.
.	.	.	.	.	.	.
.	.	.	.	.	.	.
$name_n$	$type_n$	$cargo_n$	$length_n$	$s\text{-}code_n$	$l\text{-}code_n$	hh:mm

Encounters List may be rolled up or down if too large for screen

Where:

name = 25 characters (or less) vessel name
type = ?-letter vessel type code
cargo = ?-letter cargo type code
length = vessel length in feet
s-code = OVERTAKING
or CROSSING
or MEETING
l-code = 1-WAY
or 2-WAY
minutes = time of day that encounter will occur

Note: This is a static display. The data displayed is not updated.

Entered From	When
4	List entry 2 (system default) entered
5	Valid time span entered
6	Valid waypoint entered

Exit To	When
1	Automatic

13.4 RELATIVE POSITION

The Relative Position function provides the watchstander with the range and bearing between two, designated points and displays a line connecting the points on the map display (if a map display exists). These points may be specified as vessels, navigational aids (navaids), cursor positions on the map display, latitude and longitude coordinates, or any combination of the above. The system computes and displays this information by using data from the passage and waterway files.

Figure 13-4 depicts the RELATIVE POSITION function described below.

13.4.1 State 1 - Ready State

See subsection 6.2.1.1, the Ready State.

13.4.2 State 2 - Identify Origin Point

- Substate A - Specify Identification Methods
  The watchstander must enter the point identification method desired.

Display:

```
Function Name
Identify Origin Point
Choose one of the following position identification methods:
1.  Type Latitude and Longitude
2.  Set Position with Map Cursor
3.  Identify Vessel
4.  Identify Navaid

_
```

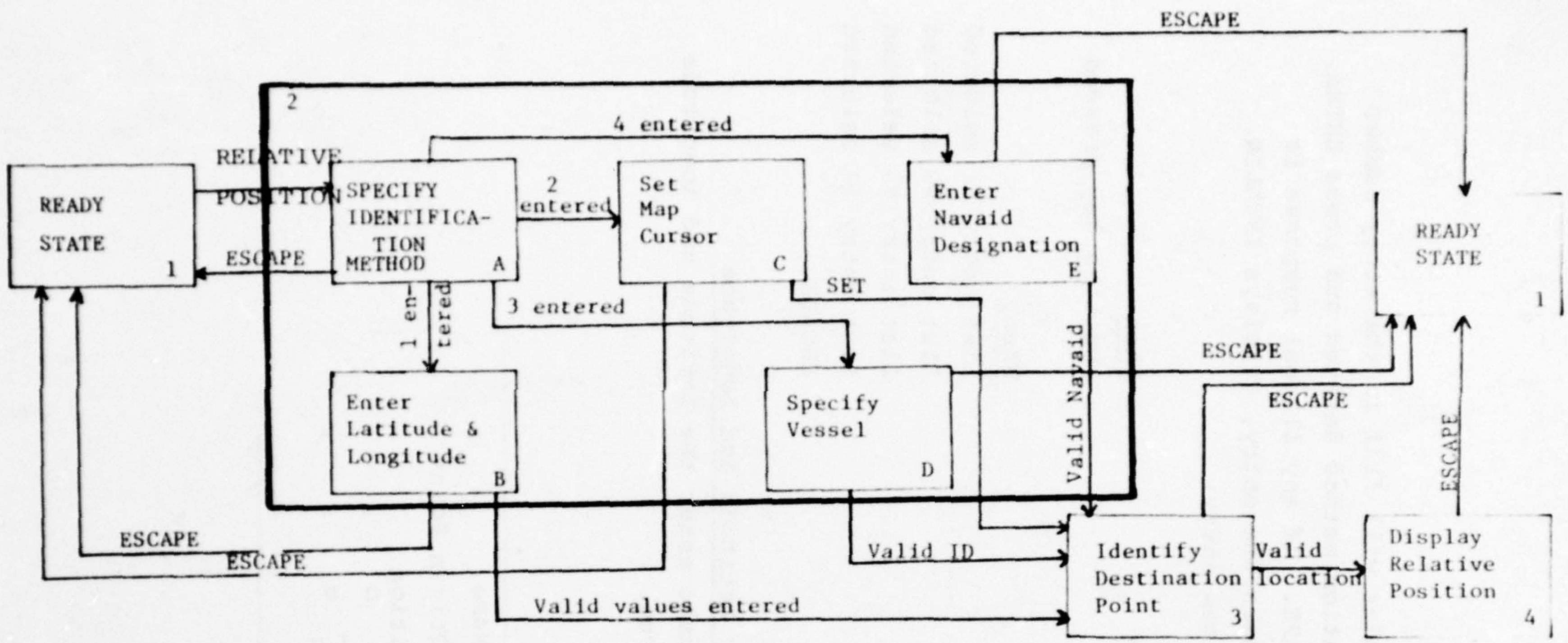


FIGURE 13-4. RELATIVE POSITION

Actions: The watchstander will fill in the entry number of the point identification method desired and press ENTER, or he may enter an ESCAPE. If any illegal response is entered, the system clears the entry, displays INVALID RESPONSE, and awaits a new entry.

Entered From	When
1	Function key pressed

Exit To	When
2B	List entry #1 selected
2C	List entry #2 selected
2D	List entry #3 selected
2E	List entry #4 selected
1	ESCAPE

- Substate B - Enter Latitude and Longitude
  The watchstander must enter the latitude and longitude of the point desired.

Display:

```
Function Name
Identify Origin Point
Enter position
Latitude:_  °   '   "
Longitude:  °   '   "
```

Actions: The watchstander will fill in the latitude and longitude values desired and press ENTER, or he may enter an ESCAPE. If an illegal response is entered, the system will clear the entry, display the appropriate error message and await a new entry. INVALID FORMAT is displayed if an illegal format for the coordinates is entered, COORDINATES OUTSIDE OF SYSTEM if the coordinates are outside the VTC system, or INVALID RESPONSE if any other illegal response is entered.

Entered From	When
2A	List entry 1 selected

Exit To	When
3	Valid values entered
1	ESCAPE

- Substate C - Set Map Cursor Position
  The watchstander must set the map cursor at the point desired.

Display:

```
Function Name
Identify Origin Point
Position map cursor and press SET key.
```

Actions: The watchstander will position the map cursor and press SET, or he may enter an ESCAPE. If an illegal response is entered, the system will display INVALID RESPONSE and await a new entry.

Entered From	When
2A	List entry 2 selected

Exit To	When
3	Map cursor set
1	ESCAPE

- Substate D - Specify Vessel

  The state corresponds to state 2 of the Modify Passage function. See subsection 6.2.2, Specifying a Vessel.

Entered From	When
2A	List entry 3 selected

Exit To	When
3	Valid vessel specified
1	ESCAPE

- Substate E - Enter Navaid Designation

  The watchstander must enter the navaid designation of the point desired.

Display:

```
Function Name
Identify Origin Point.
Enter Navaid Designation:

_
```

Actions: The watchstander will fill in the navaid designation of the point desired and press ENTER, or he may enter an ESCAPE. If an illegal response is entered, the system will clear the entry, display INVALID RESPONSE and await a new entry.

Entered From	When
2A	List entry 4 selected

Exit To	When
3	Valid navaid entered
1	ESCAPE

13.4.3 State 3 - Identify Destination Point

This state is similar to state 2, except that it identifies the destination point.

Entered From	When
2	Origin point entered

Exit To	When
4	Destination point entered
1	ESCAPE

13.4.4 State 4 - Display Relative Position

The system calculates and displays the range and bearing between the two points previously specified. A line appears on the map display connecting the two points, with an arrowhead pointing at the destination.

Display:

```
RELATIVE POSITION
Origin Lat:  dd°mm'ss"    Long:  ddd°mm'ss"
Destination Lat:  dd°mm'ss"   Long:  ddd°mm'ss"
Range  (Nautical Miles):
Bearing: °
```

The displayed items are dynamic. If at least one of the points is a vessel, the data is updated every six seconds.

Actions: The watchstander may enter an ESCAPE.

Entered From	When
3	Destination point entered

Exit To	When
1	ESCAPE

13.5 CLOSEST POINT OF APPROACH (CPA)

The Closest Point of Approach (CPA) function provides the watchstander with the relative bearing and distance between two points at the predicted CPA, as well as the time until CPA. At least one point must be a vessel in track by a level 4 or 5 sensor. However, the other point may be specified as a vessel, navigational aid (navaid), cursor position in the map display, or latitude and longitude coordinates. The system computes and displays the CPA information using data from the passage and waterway files. The map display (if a map display exists) will show a solid line from each moving vessel to its position at CPA, and a dashed line connecting the two points at CPA.

Figure 13-5 depicts the CPA function described below.

13.5.1 State 1 - Ready State

See subsection 6.2.1.1, the Ready State.

13.5.2 State 2 - Identify Origin Point

See subsection 13.4.2 of the Relative Position function.

13.5.3 State 3 - Identify Destination Point

This state corresponds to subsection 13.4.3 of the Relative Position function, except that in substates B, C, D or E if neither point is moving, the system enters state 5 and if the time until the CPA is greater than the system threshold, the system enters state 6. Otherwise, the system enters state 4 as in the Relative Position function.

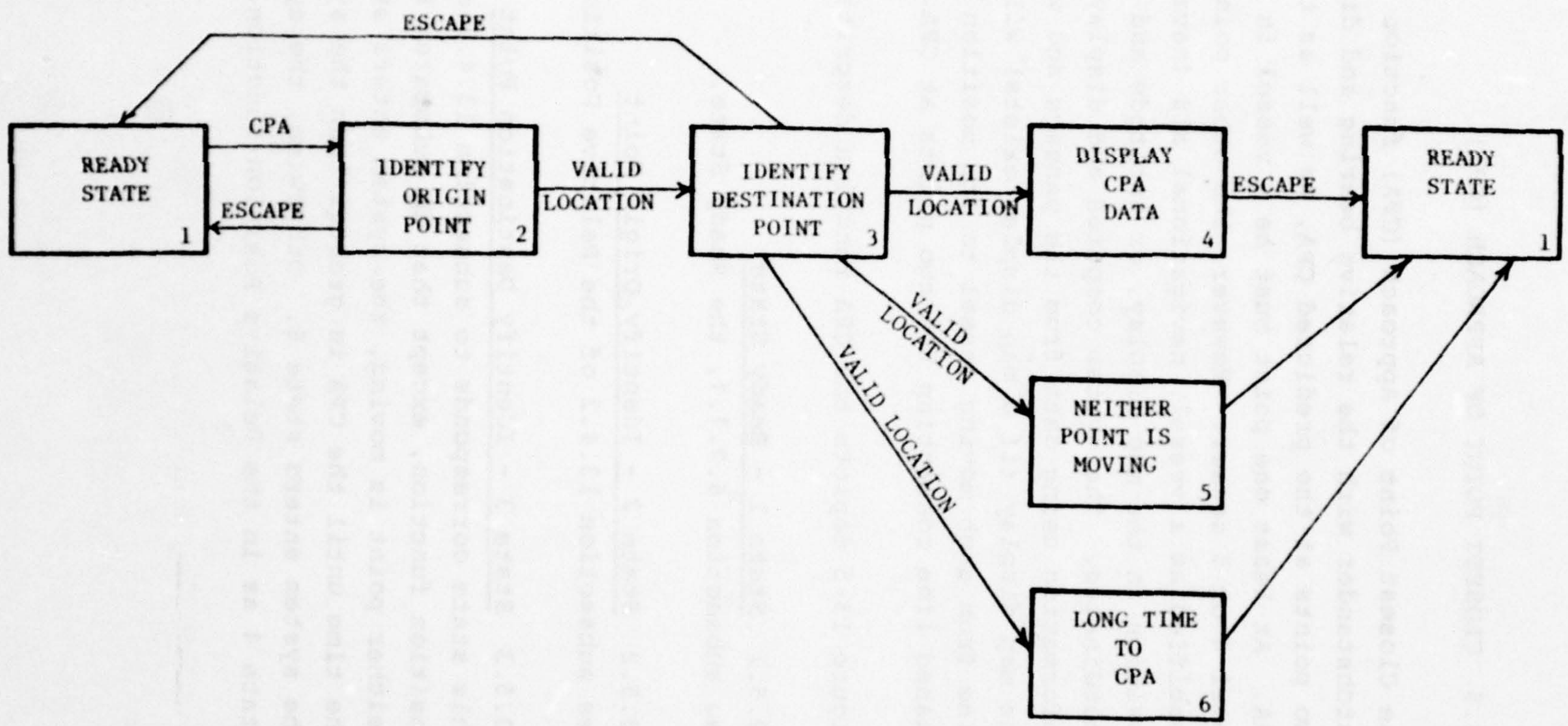


FIGURE. 13-5. CLOSEST POINT OF APPROACH

13.5.4 State 4 - Display CPA Data

The system calculates and displays the range and bearing at the CPA between the two points specified and the time until the CPA.

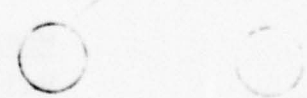
Display:

```
CLOSEST POINT OF APPROACH
Distance of CPA (yards):
Bearing at CPA: ddd°
Time Until CPA (Minutes): mm
```

Map:

If one position stationary:

If two moving vessels:



The displays shall be updated at the same rate as vessel positions (minimum of 6 second intervals).

Actions: The watchstander may enter an ESCAPE.

Entered From	When
3	Valid position identified

Exit To	When
1	ESCAPE

13.5.5 State 5 - Neither Point Moving

The watchstander is notified that neither point specified is moving.

Display:

CLOSEST POINT OF APPROACH
Neither Point Moving

Actions: None

Entered From	When
3B/C/D/E	Valid position entered

Exit To	When
1	Automatic

13.5.6 State 6 - Long Time to CPA

The watchstander is notified that the time to CPA is greater than the system threshold.

Display:

CLOSEST POINT OF APPRAOCH

Time to CPA greater than nn minutes

Actions: None

Entered From	When
3B/C/D/E	Valid point entered

Exit To	When
1	Automatic

13.6 ROUTE/SCHEDULE

The Route/Schedule function provides the watchstander with up to three proposed routes for a specified vessel, presented one at a time in order of preference, along with a schedule of arrival times at waypoints along the proposed routes. The system selects the routes/schedules to minimize congestion at critical points and encounters in constructed waters by comparing the routes/schedules of the vessel specified with those of other vessels already underway. The watchstander chooses the route/schedule desired of the system provided routes and schedules, and enters it into the system.

Figure 13-6 depicts the ROUTE/SCHEDULE function described below.

13.6.1 State 1 - Ready State

See subsection 6.2.1.1,the Ready State.

13.6.2 State 2 - Specify Vessel

See subsection 6.2.2, Specifying a Vessel.

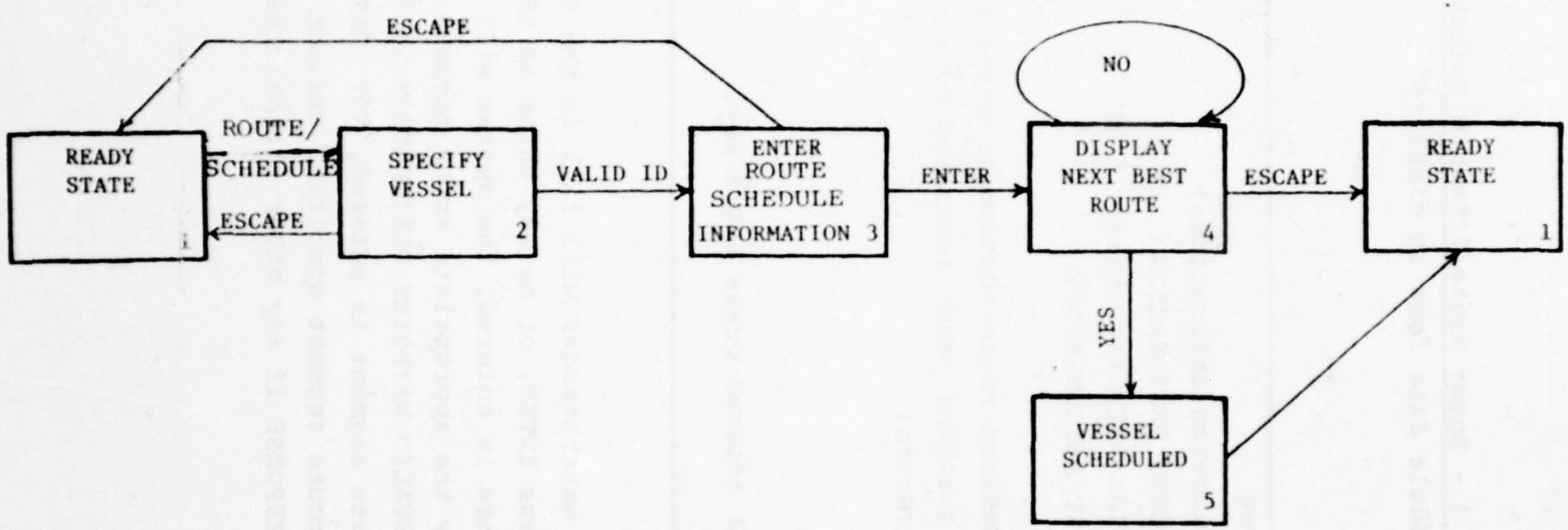


FIGURE 13-6. ROUTE/SCHEDULE

13.6.3 State 3 - Enter Route/Schedule Information

The route/schedule data form is displayed.

Display:

```
ROUTE/SCHEDULE
Enter the following information:
INITIAL WAYPOINT DESIGNATION :
TIME AT INITIAL WAYPOINT (hh:mm):
FINAL WAYPOINT DESIGNATION:
SPEED (knots):
To Specify desired route (Optional) enter route
segment designations (each separated by a comma)
or carriage return:



When all data entered press ENTER key.
```

This screen area may be rolled up or down to provide room for all route segments.

Actions: The watchstander will fill in the data entry fields and press ENTER, or he may enter an ESCAPE. If an illegal response is entered, the system will clear the entry, display the appropriate error message, and await a new entry. INVALID WAYPOINT DESIGNATION is displayed if an illegal route segment is entered, NOT CONTIGUOUS if the waypoint and route segment specified are not contiguous and INVALID RESPONSE if any other illegal response is entered.

Entered From	When
2	Valid vessel ID entered

Exit To	When
4	ENTER
1	ESCAPE

13.6.4 State 4 - Display Best Route/Schedule

The system computes and displays the best route/schedule for the vessel specified.

Display:

```
ROUED/SCHEDULE
Optional Route 1 (2 or 3)
   Waypoint                  Time at Waypoint
     ww_1                       hh:mm_1
     ww_2                       hh:mm_2
      .                            .
      .                            .
      .                            .
     ww_n                       hh:mm_n
Press YES to use this route.
Press NO to display next optional route.
```

A set of line segments appears on the map display to indicate the proposed route (or portion of the route within the sector currently displayed).

Actions: The watchstander will press YES to enter the route/schedule displayed, NO to display the next best route/schedule, or he may enter an ESCAPE. A total of three optional routes may be displayed. After displaying the third proposed route, the watchstander may continue pressing NO to redisplay the three optional routes.

Entered From	When
3	ENTER

Exit To	When
5	YES pressed
4	NO pressed
1	ESCAPE

13.6.5 State 5 - Vessel Scheduled

The watchstander is notified that the desired route/schedule for the vessel specified has been entered into the system.

Display:

```
ROUTE/SCHEDULE
Vessel Route/Schedule is now entered.
```

Actions: None

Entered From	When
4	YES

Exit To	When
1	Automatic

13.7 ALERT RESPONSE

The Alert Response function allows the watchstander to respond to any alert currently on display. The watchstander may then change the status of the alert.

In all states the alert display screen displays a line of information for each alert which is currently on the alert queue of any watchstander. A maximum of 20 alert entries may be queued. The entries are in order of priority with the highest priority alert entry at the top of the alert screen (just below the header). The alert screen is automatically updated by the system as alert changes occur. The alert screen format is as follows:

NO	TYPE	REM TIME	SECTOR	STATUS	Header Line
nn	tttttt	hh:mm:ss	xxxxxxx	ssssssss	Alert Entry
.	.	.	.	.	.
.	.	.	.	.	.
					.

nn is the 2 digit module 100 integer automatically assigned as an identifier for the alert by the system

tttttt is a 6 letter alert type designation. It may be one of the following:

COLLIS - collision
LANE - lane stray
ROUTE - route stray
GROUND - grounding
CONGST - excessive congestion
ENCNTR - dangerous encounter
ANCHOR - anchor drift
SPEED - excessive vessel speed

hh:mm:ss is the time remaining for "effective action". The hours field is suppressed unless non-zero. The time remaining for effective action for each alert type is as follows:

COLLIS - Time until CPA
LANE - Time until vessel actually leaves the lane
ROUTE - Not applicable
GROUND - Time until vessel will actually enter the cell or route segment where grounding is possible
CONGEST - Time until the congestion will actually occur
ENCTR - Time until the encounter will actually occur

xxxx is the sector designation, consisting of a maximum of 4 alphanumeric characters

sssssss is an alphabetic alert status designation. It may consist of 3 to 8 letters. It may be one of the following:

NEW - No response has yet been made by a watchstander to this alert.

REALERT - The alert has been scheduled to turn on the watchstander alarm(s) at a time specified by the watchstander.

CANCELED - The alert has been canceled.

HOLD - The watchstander has responded to the alert, but has decided to leave it on the watchstander alert queue.

RESTORED - The alert has been placed on the alert queue of every watchstander.

Figure 13-7 depicts the ALERT RESPONSE function described below.

13.7.1 State 1 - Ready State
See subsection 6.2.1.1, the Ready State.

13.7.2 State 2 - No Alerts
The watchstander is notified that there are no alerts queued to him.

Display:

```
ALERT RESPONSE
NO ALERTS
```

Actions: None

Entered From	When
1	ALERT RESPONSE - No alerts

Exit To	When
1	Automatic

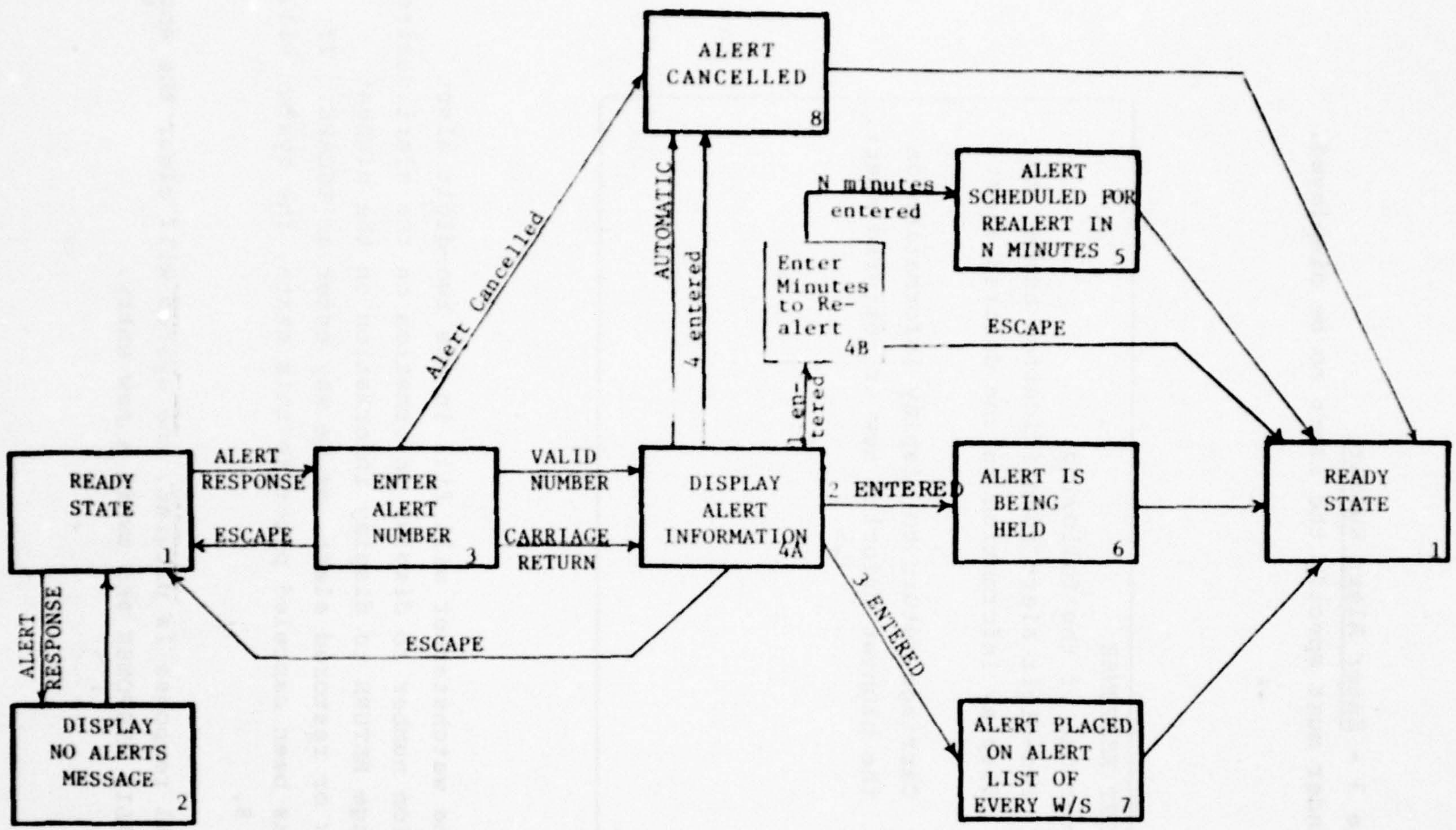


FIGURE 13-7. ALERT RESPONSE

13.7.3 State 3 - Enter Alert Number

The watchstander must specify the alert to be displayed.

Display:

```
ALERT RESPONSE
Enter one of the following:
1.  Two-digit alert identification number to
    display information on the desired alert.

2.  Carriage return to display information on
    the highest priority new or restored alert.




_
```

Actions: The watchstander will fill in the two-digit alert identification number to display information on the alert desired, press carriage RETURN to display information on the highest priority new or restored alert, or he may enter an ESCAPE. If the alert has been canceled prior to this state, the system will enter state 8.

If an illegal response is entered, the system will clear the entry, display INVALID RESPONSE and await a new entry.

Entered From	When
1	ALERT RESPONSE

Exit To	When
4	Valid alert ID or carriage RETURN
8	Alert canceled
1	ESCAPE

13.7.4 State 4 - Display Alert Information

- Substate 4A

Information relating to the alert specified is displayed on the screen and the map display (i.e., if a map display exists). The information items displayed differ according to the type of alert, as shown in Figure 13-8 A/B. Following the display of the appropriate alert information, the watchstander must designate the current status of the alert.

Display:

```
Choose one of the following:
   1.  Realert
   2.  Hold
   3.  Restore
   4.  Cancel      ___
```

Actions: The watchstander will fill in the alert status entry number desired: 1 to realert, 2 to hold, 3 to restore, or 4 to cancel. The watchstander may also enter an ESCAPE or an illegal response. If an illegal response is entered, the system will clear the entry, display INVALID RESPONSE and await a new entry. If the alert is canceled while in state 4, the system will automatically enter state 8.

Entered From	When
3	Valid alert ID or carriage RETURN

Exit To	When
4B	Entry number 1 entered
6	Entry number 2 entered
7	Entry number 3 entered
8	Entry number 4 entered
1	ESCAPE

TYPE OF ALERT	ALPHANUMERIC INFORMATION	MAP DISPLAY PRESENTATION
Collision	Vessel names, types, cargos, lengths and beams. Time to CPA of vessel centroids Separation of vessel centroids at CPA Relative bearing and range between vessels	Affected vessels circled
Grounding	Vessel name, type, cargo, length, and draft Depth of water Time until grounding	Vessel circled Grounding point indicated
Lane Stray	Vessel name, type, cargo, and length	Vessel circled
Route Stray	Vessel name, type, cargo, and length Intended route segments Actual route segment (if any)	Vessel circled Intended route shown

Figure 13-8A. Information Presented by the Alert Response Function (Page 1 of 3)

TYPE OF ALERT	ALPHANUMERIC INFORMATION	MAP DISPLAY PRESENTATION
Navaid Adrift or Missing	Name of navaid Normal position Normal watch circle radius Distance from normal position (if in track) Course and speed of drift (if in track)	Normal position Present position
Anchor drift	Vessel name, type, length Anchorage designation Normal swing radius Distance from normal position Course and speed of drift	Normal anchorage position Actual position Direction of drift indicated
Critical Point Congestion	Critical point designation Normal capacity Predicted density Names of all vessels involved	Critical point indicated All vessels affected circled
Dangerous Encounter	Name of route segment involved Time until encounter Type of encounter Vessel names, types, cargoes, and length	Affected vessels circled Encounter point indicated

Figure 13-8A (Page 2 of 3)

TYPE OF ALERT	ALPHANUMERIC INFORMATION	MAP DISPLAY PRESENTATION
Excessive Vessel Speed	Vessel name, type, cargo, and length Authorized speed Actual speed	Affected vessel circled

[1] For stations with map display installed.

Figure 13-8A (Page 3 of 3)

▶ Collision

```
ALERT RESPONSE
COLLISION ALERT
VESSEL:  name
TYPE:
CARGO:
LENGTH (FEET):
BEAM (FEET):
VESSEL:  name
TYPE:
CARGO:
LENGTH (FEET):
BEAM (FEET):
TIME TO CPA:  mm:ss
SEPARATION AT CPA (FEET)
BEARING (FROM 1st VESSEL TO 2nd VESSEL):
RANGE (FEET):
```

▶ Lane Stray

```
ALERT RESPONSE
LANE STRAY ALERT
VESSEL:  name
TYPE:
CARGO:
LENGTH (FEET):
```

Figure 13-83. Display for each Alert Type (Page 1 of 5)

▶ Route Stray

ALERT RESPONSE
ROUTE STRAY ALERT
VESSEL: name
TYPE:
CARGO:
LENGTH (FEET):
INTENDED ROUTE SEGMENTS:
ACTUAL ROUTE SEGMENT:

▶ Anchor Drift

ALERT RESPONSE
ANCHOR DRIFT ALERT
VESSEL: name
TYPE:
LENGTH:
ANCHORAGE:
SWING RADIUS: (FEET):
DISTANCE FROM NORMAL POSITION (FEET):
COURSE OF DRIFT (KNOTS):
SPEED OF DRIFT (KNOTS):

Figure 13-8B (Page 2 of 5)

▶ Navaid

```
ALERT RESPONSE
NAVAID ADRIFT/MISSING ALERT
NAME:
   NORMAL POSITION:
   WATCH CIRCLE RADIUS (FEET):
   DISTANCE FROM NORMAL POSITION (FEET):
   COURSE OF DRIFT:
   SPEED OF DRIFT (KNOTS):
```

In the above display if the Navaid is missing (i.e., not in track) then the distance, course and speed entries contain the word 'UNKNOWN'.

▶ Grounding

```
ALERT RESPONSE
GROUNDING ALERT
VESSEL: name
   TYPE:
   CARGO:
   LENGTH (FEET):
   DRAFT (FEET):
DEPTH (FEET):
TIME TO GROUNDING: mm:ss
```

Figure 13-8D (Page 3 of 5)

▶ Critical Point Congestion

ALERT RESPONSE
CRITICAL POINT CONGESTION ALERT
CRITICAL POINT: name
NORMAL CAPACITY:
PREDICTED DENSITY:
VESSELS: name_1
name_2
.
.
.
name_n

▶ Dangerous Encounter

ALERT RESPONSE
DANGEROUS ENCOUNTER ALERT
ROUTE SEGMENT: name
TIME UNTIL ENCOUNTER: hh:mm:ss
TYPE OF ENCOUNTER:
VESSEL: name
TYPE:
CARGO:
LENGTH (FEET):

Figure 13-8B (Page 4 of 5)

> Excessive Vessel Speed

```
ALERT RESPONSE
EXCESSIVE SPEED ALERT
VESSEL:  name
TYPE:
CARGO:
LENGTH (FEET):
AUTHORIZED SPEED (KNOTS):
ACTUAL SPEED (KNOTS):
```

Figure 13-8B (Page 5 of 5)

- Substate 4B

  If a 1 (realert) is entered in substate 4A, the system will request the number of minutes until the alert alarm is to be activated.

Display:

Enter number of minutes until realert:

Actions: The watchstander will enter the number of minutes, or ESCAPE. If an illegal entry is made, the system will clear the entry, display INVALID RESPONSE and await a new entry.

Entered From	When
4A	1 (realert) entered

Exit To	When
5	Number of minutes entered
1	ESCAPE

13.7.5 State 5 - Realert Scheduled

The watchstander is notified that the alert will be activated in N minutes. The system changes the status field of the alert entry displayed to REALERT to indicate that the alert has been rescheduled.

Entered From	When
4B	Number of minutes entered

Exit To	When
1	Automatic

13.7.6 State 6 - Alert on Hold

The watchstander is notified that the alert is being held. The system then changes the status field of the alert entry displayed to HOLD to indicate that the alert is being held for later watchstander response.

Entered From	When
4	Entry number 2 entered

Exit To	When
1	Automatic

13.7.7 State 7 - Alert Restored

The watchstander is notified that the alert has been placed on the alert queue of every other watchstander and the system changes the status field of the alert entry displayed to RESTORED to indicate this action.

Entered From	When
4	Entry number 3 entered

Exit To	When
1	Automatic

13.7.8 State 8 - Alert Canceled

The watchstander is notified that the alert has been canceled. The alert then assumes the lowest priority and is posted on the first available line from the bottom of the display. If no space is available, a canceled alert is dropped from the display. Any new alert can remove a canceled alert from the display when it it necessary to accommodate a new alert.

Entered From	When
4	Entry number 4 entered
3	Automatic cancel by hazard detection processes

Exit To	When
1	Automatic

14 AUTOMATIC BACKGROUND PROCESSES

The VTS Processing/Display Subsystem performs many of its functions as a result of the direct actions of the watchstanders. For a Class A, Level 1 system, the operator invoked functions represent effectively the entire system. However, as automatic sensors are added to the basic system, functions may be added to automate the task of determining a vessel's location, course and speed. Automatic sensors can also provide more accurate and timely information which can be used to detect potentially hazardous conditions in the VTS coverage area. The VTS Processing/Display Subsystem then provides more than *information*, as in a Level 1 system; it can automatically detect potential hazards and provide information to the vessel, or vessels, involved so that the potentially hazardous condition can be avoided.

14.1 *VIEWPOINT OF STATE DIAGRAMS*

State diagrams will also be used to specify the automatic background processes ; however, they will be founded on a very different viewpoint than the operator invoked functions.

While the state diagrams of the operator invoked functions primarily show the states of the display, the state diagrams of the automatic processes will show states of the external world, as it is being monitored. In most cases the viewpoint is the state of a vessel. But in some cases, the diagrams show the states of pairs of vessels, or the states of an area of the waterway, or the states of a Navaid.

14.2 HAZARD DETECTION PROCESSES

The VTS Processing/Display Subsystem will have the capability of detecting the following hazards:

. Potential Collision
. Lane Stray
. Route Stray
. Potential Grounding
. Excessive Congestion
. Dangerous Encounter
. Anchor Drift
. Navaid Adrift/Missing
. Excessive Vessel Speed

The task of the software is to recognize these conditions and report the potential hazards to the watchstanders as alerts.

In order to recognize these conditions, the software must monitor the data on the location, course, and speed of vessels and Navaids.

Recognizing that processing resources will be required to perform these functions, a maximum frequency of execution is given for the monitoring software for each function in the subsections which follow.

A variety of normal conditions can be cited which would result in an alarm. To prevent these false alarms the system will allow the Watch Supervisor to exempt any particular physical area(s) from any or all of these hazard checks. This capability may be used, for example, to prevent false collision warning alerts in narrow channels where vessels pass so close together that even in a normal passing situation, an alert would have resulted.

Additionally, the system will allow watchstanders to exempt particular vessels from any or all of the hazard checks. This capability may be used to avoid false collision alarms for pilot boats, tugs, etc., which have intentional "collisions" as a part of their every day operation, or to prevent lane stray alarms for ferries, etc., which are not normally constrained to lanes, or other similar situations.

14.2.1 Potential Collision

The system will be required to detect potential collisions if sensors are available which can determine the location, course and speed of the vessels with a high degree of accuracy.

The detection of potential collisions will require a periodic check of each pair of vessels in the area covered by Level 4 or 5 sensors. Depending on the algorithm used, the processing required can be very large because for n vessels, n (n-1)/Z checks must be made.

To minimize the processing required, three conditions, each more selective, have been specified. The state diagrams will show vessel pairs in states which include the requirement for the stages of processing.

Figure 14-1 depicts the Potential Collision process which is described below. Each pair of vessels in the area of concern will be in one of the states shown.

14.2.1.1 State 1 - Vessel Pair Exempt

Vessel pairs will be in the exempt state if any of the following is true:

. Both vessels unidentified
. Both vessels anchored or docked
. One or both vessels marked exempt

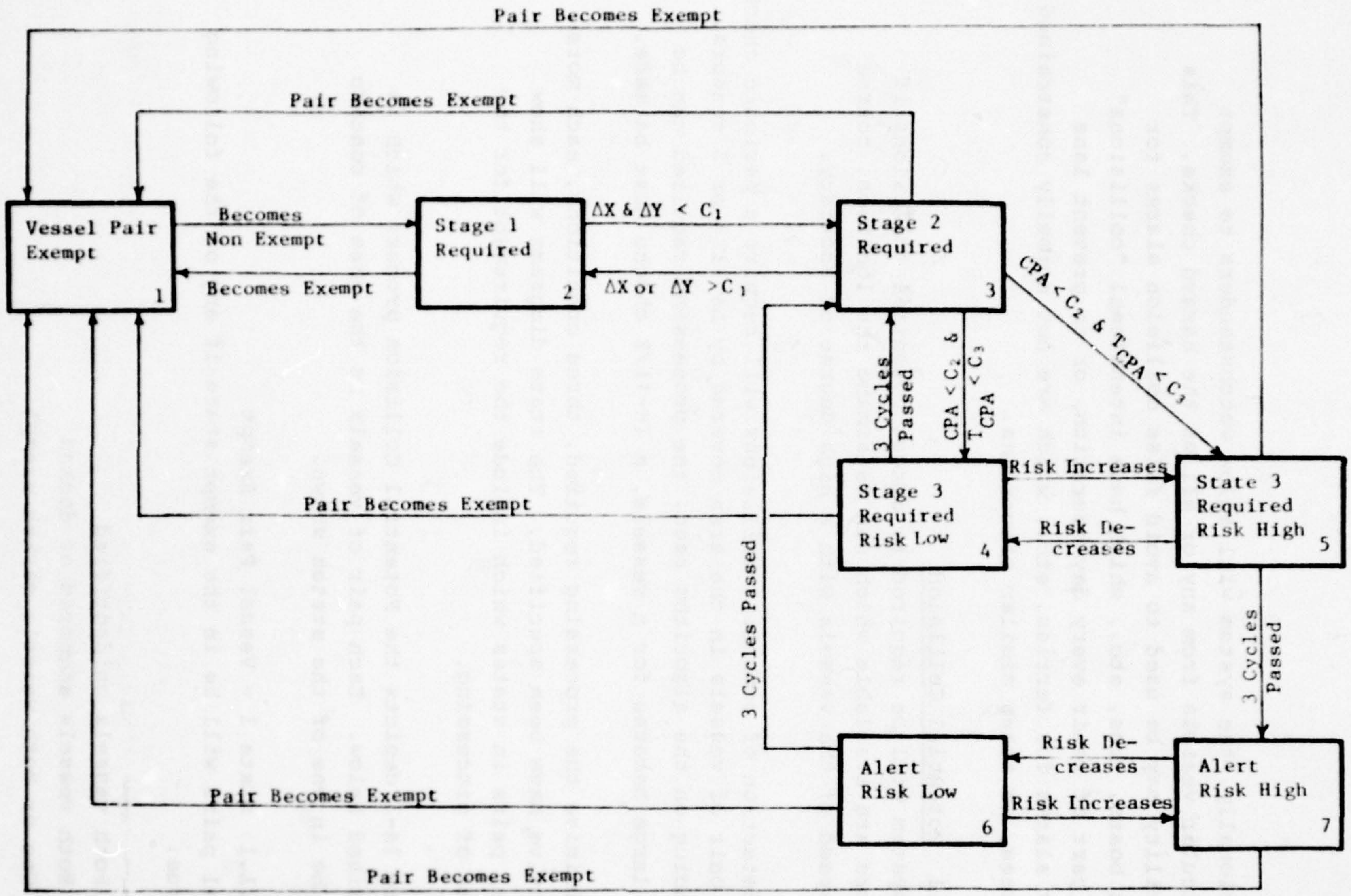


Figure 14-1. POTENTIAL COLLISION

. One or both vessels in an exempt area

. One or both vessels is not in track by Level 4 or 5 sensors

The vessel pair enters State 2 when none of the above is true and returns to State 1 from any of the other states when one of the above becomes true.

14.2.1.2 State 2 - Stage 1 Processing Required

State 2 is entered from State 1 when any vessel pair becomes non-exempt. The vessel pair moves from State 2 to State 3 when the difference between both their x or y coordinates is less than a selectable constant C_1, indicating that the vessels are sufficiently close together that further checking for potential collision is desirable.

Vessel pairs can physically exit State 2 for State 3 at any time. The processing performed to detect this transition, however, shall be done periodically at a selectable rate which will not be faster than once every 30 seconds.

14.2.1.3 State 3 - Stage 2 Processing Required

A vessel pair enters State 3 from State 2 when both Δx and Δy are less than C_1. The vessel pair returns to State 2 when either Δx or Δy is greater than C_1. The vessel pair may move to State 4 or State 5 if the CPA is less than a selectable constant C_2 and the time to CPA is less than another selectable constant C_3. State 4 is entered if the risk value is low. State 5 is entered if the risk value is high.

The risk value is computed by the formula:

$$\text{Risk} - \frac{+C_4\ (S-CPA)}{t_{CPA}} - C_5\left(\frac{dCPA}{t_{CPA}}\right) + H$$

Where H is the sum of the cargo hazard factors for the two vessels, S is a size hazard factor which is a function of the two vessel sizes and d_{CPA} is the rate of change of CPA.

Processing to detect changes in a state which could cause a vessel to exit State 3 will be performed at a rate not faster than once every 15 seconds.

14.2.1.4 State 4 - Stage 3 Processing Required (Risk Low)
State 4 is entered from State 3 when the risk value is low but the Stage 2 tests are passed. State 4 may also be entered from State 5 when the risk value has been high for less than the required time and becomes low.

The vessel pair returns to State 3 after it has remained in State 4 for three processing cycles. The vessel pair may also return to State 1 if the pair becomes exempt.

State 3 processing shall be repeated no more frequently than once every six seconds.

14.2.1.5 State 5 - Stage 3 Processing Required (Risk High)
State 5 is entered from State 3 when the risk value is high and the Stage 2 tests are passed. State 5 may also be entered from State 4 if the risk value increases.

State 5 is exited for State 7 if the risk remains high for three processing cycles. State 5 will be exited for State 4 if the risk value decreases and may exit to State 1 if the pair becomes exempt.

14.2.1.6 State 6 - Alert Issued (Risk Low)
State 6 is entered from State 7 when an alert is in progress and the risk value drops. The vessel pair remains in State 6 until the required time has passed with the risk value low at which point State 3 is entered.

The vessel pair returns to State 7 if the risk value increases before the time limit is exceeded.

If the vessel pair becomes exempt while in State 6, State 1 is entered immediately.

14.2.1.7 State 7 - Alert Issued (Risk High)

State 7 is entered from State 3 when the risk stays high for more than the required time.

State 6 is entered from State 7 if the risk value drops. If the risk value becomes high again before the time limit has expired, the vessel pair returns to State 7 from State 6.

If the vessel pair becomes exempt, State 1 is entered immediately from State 7.

14.2.2 Lane Stray

An alert is issued when the reported position of an identified vessel is outside the proper lane of travel, or will be outside in "n" minutes (based on straight line dead reckoning), where "n" is a data base constant accessible by the Watch Supervisor station.

The processing required to detect lane strays will be repeated at a rate not faster than once every 30 seconds. Only identified underway vessels which are in track by Level 4 or 5 sensors will be considered.

Figure 14-2 depicts the Lane Stray process described below.

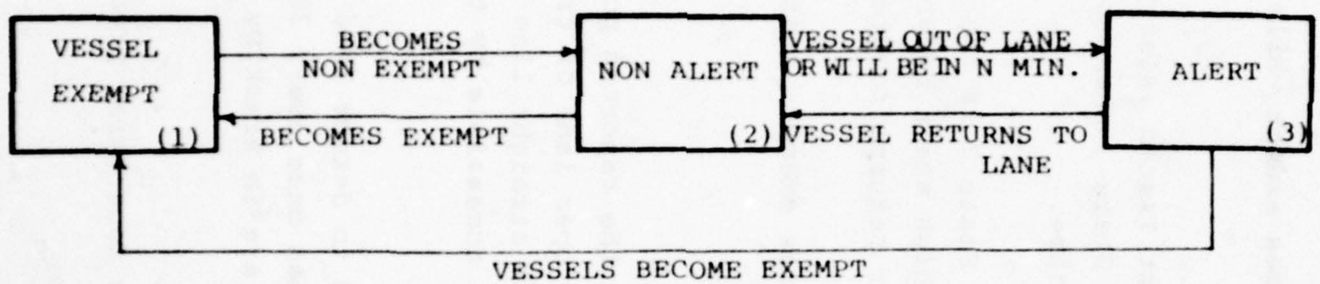


FIGURE 14-2. LANE STRAY

14.2.2.1 State 1 - Vessel Exempt

A vessel will be in the exempt state if any of the following is true:

- . Vessel unidentified
- . Vessel anchored or docked
- . Vessel marked exempt
- . Vessel in an exempt area
- . Vessel not in track by Level 4 or 5 sensors.

A vessel enters State 2 when none of the above is true and returns to State 1 from any of the other states when one of the above becomes true.

14.2.2.2 State 2 - Non-Alert

A vessel is in State 2 when it is not exempt and the vessel is in its proper lane of travel and will be for the next "n" minutes.

If the vessel becomes exempt, the vessel returns to State 1. If the vessel leaves the assigned lane of travel or assumes a course that would take it out of the lane in "n" minutes, the vessel enters State 3.

14.2.2.3 State 3 - Alert

In State 3, the vessel is outside its lane or will be in "n" minutes. An alert will be issued until the vessel leaves State 3. The vessel will leave State 3 for State 1 if it becomes exempt. The vessel will return to State 2 if the vessel returns to its lane.

14.2.3 <u>Route Stray</u>

Each identified non-exempt vessel's reported location will be compared with its intended route. A route stray alert will be issued if:

- A vessel is in a Level 1, 2, or 3 area and the reported waypoint does not lie on the route segment specified by the vessel's prescribed route;

- A vessel is in track by Level 4 or 5 sensors and the reported position is not within a predefined distance from any route segment of a vessel's prescribed route.

In a Level 1, 2, or 3 area, the check will be performed each time the reported vessel position is updated. In Level 4 or 5 areas, it will be repeated at a rate not faster than once every 30 seconds.

Figure 14-3 depicts the Route Stray process described below.

14.2.3.1 State 1 - Vessel Exempt
See Subsection 14.2.2.1 of the Lane Stray process.

A vessel will leave State 1 and enter either State 2 or State 4 (depending on the sensor level) when none of the above is true, and return to State 1 when any of the above becomes true.

14.2.3.2 State 2 - Vessel Non-Exempt (Level 1, 2, or 3 Sensors)
A vessel which is in an area covered by Level 1, 2, or 3 sensors will enter State 2 when it becomes non-exempt. If the vessel again becomes exempt, it will return to State 1.

If the reported location of the vessel is outside the specified route of travel, the vessel will enter State 3 and an alert will be issued.

If the vessel enters a Level 4 or 5 area, it will enter State 4, unless the Level 4 or 5 sensors indicate that the vessel is off its route; in which case, the vessel will enter State 5.

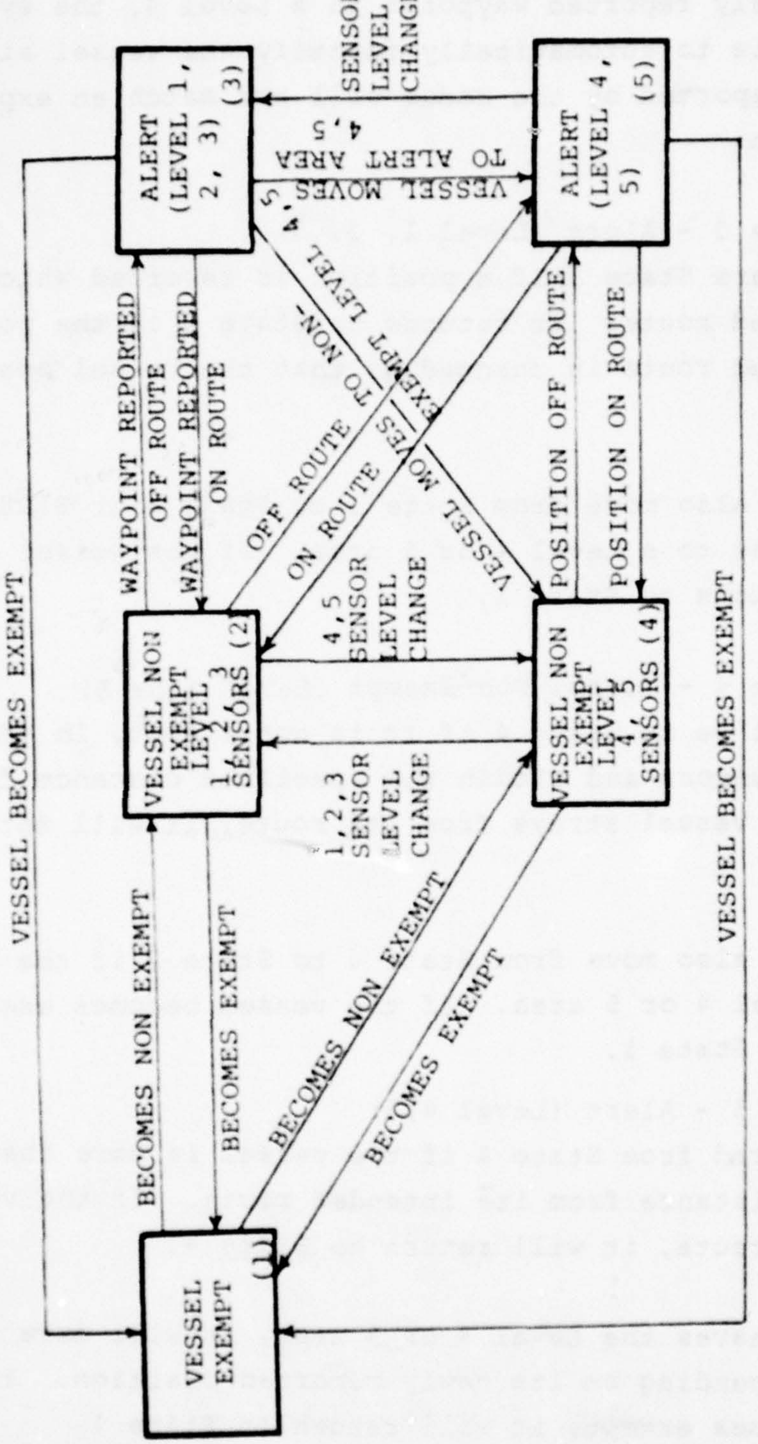


FIGURE 14-3. ROUTE STRAY

Note: If the vessel has strayed from its route when passing from a previously reported waypoint to a Level 4, the system will not be able to automatically identify the vessel since the position reported by the radar will not match an expected vessel location.

14.2.3.3 State 3 - Alert (Level 1, 2, 3)

The vessel enters State 3 if a position is reported which is not on the specified route. It returns to State 2 if the position or the specified route is changed so that the vessel position lies on the route.

The vessel can also move from State 3 to State 4 or State 5 if the vessel moves to a Level 4 or 5 area. If the vessel becomes exempt, it returns to State 1.

14.2.3.4 State 4 - Vessel Non-Exempt (Level 4 or 5)

The vessel will be in State 4 if it is non-exempt, in track by Level 4 or 5 sensors and within the specified distance from its route. If the vessel strays from its route, it will enter State 5.

The vessel can also move from State 4 to State 2 if the vessel leaves the Level 4 or 5 area. If the vessel becomes exempt, it will return to State 1.

14.2.3.5 State 5 - Alert (Level 4,5)

State 5 is entered from State 4 if the vessel is more than a predetermined distance from its intended route. If the vessel returns to its route, it will return to State 4.

If the vessel leaves the Level 4 or 5 area, it will move to State 2 or 3 depending on its newly reported position. If the vessel becomes exempt, it will return to State 1.

14.2.4 Potential Grounding

The system will check each identified vessel for potential grounding at a rate not faster than once every 30 seconds. The potential grounding check will be based on:

- . The reported draft of the vessel

- . The depth of water at Mean Lowest Low Water (MLLW) in the route segments or cells through which the vessel is expected to pass

- . The present water level relative to MLLW from water level sensors, tide schedules or manual entry.

The potential grounding detection process will dead reckon each vessel ahead up to a preset amount of time (as selected by the Watch Supervisor but no longer than 10 minutes) and verify that the actual water level on its intended route over that time period (i.e., the depth at MLLW plus the height of water above or below MLLW) exceeds the draft of the vessel. If a vessel is following a route structure, this dead reckoning will be based upon its reported speed and its intended route, and will consider the depth of the appropriate route segments. If, however, the vessel is not following a route structure, the dead reckoning will revert to straight line dead reckoning based on the vessel's current course and speed, and will use for the grounding determinations the depth of that portion of the waterway which the dead reckoned track will traverse.

Figure 14-4 depicts the Potential Grounding process described below.

14.2.4.1 State 1 - Vessel Exempt

See Subsection 14.2.2.1 of the Lane Stray process.

14.2.4.2 State 2 - Non-Exempt

When an exempt vessel becomes non-exempt, it enters State 2. It will return to State 1 if it again becomes exempt.

If the projected course of the vessel on its route or straight line, dead reckoned path crosses an area which has an inadequate depth of water, the vessel will move to State 3. When grounding is no longer projected the vessel will return to State 2 from State 3.

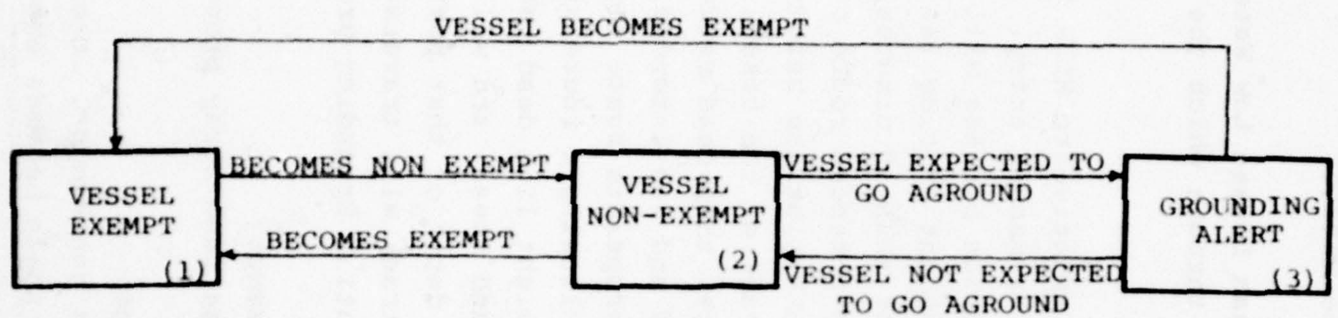


FIGURE 14-4. POTENTIAL GROUNDING

14.2.4.3 State 3 - Grounding Alert Condition

If the vessel is projected to run aground, it will enter State 3 and an alert will be issued when the system recognizes the condition. When the vessel is no longer projected to run aground, the vessel will return from State 3 to State 2. If the vessel becomes exempt, the vessel returns to State 1.

14.2.5 Excessive Congestion

The system will detect when more vessels are in or will be in a critical area than the area can safely accommodate. The checks will be repeated at a rate not faster than once every 30 seconds. Up to 40 critical areas will be defined by a center point and a radius distance (in a two dimensional harbor representation) or by waypoints and linear distances along routes from waypoints (in a one-dimensional representation). Each critical area will be assigned a maximum capacity value. The amount of actual congestion will be determined using the technique defined below which yields a congestion value. If this value will exceed the critical area's maximum capacity within a pre-established look-ahead time span (not greater than 30 minutes), a congestion alert will be issued.

The look-ahead time span will be a data base constant accessible by the Watch Supervisor station. The look-ahead will be accomplished by advancing all vessels which are in a route structure along their intended route at their reported (or measured) speed. Vessels outside a route structure will not be considered. The value each vessel contributes toward this total capacity will be dependent upon its size and cargo risk value. A table of capacity contribution constants for each of four vessel size categories will be stored in the data base and be accessible by the Watch Supervisor station. The capacity contribution resulting from the various hazardous cargoes will be the same as the 20 values established for these cargoes in the Potential Collision process (see Subsection 14.2.1). The actual congestion of an area will be the sum of the size and cargo capacity contribution constants from each vessel in the critical area.

The state diagram for Excessive Congestion is shown in Figure 14-5. The diagram is in terms of a critical area. Two states are sufficient to describe this function. An area is in the first state if excessive congestion does not exist and is not projected in the look-ahead time span; otherwise, an area will be in State 2.

14.2.6 Dangerous Encounters

The dangerous encounter checks are for use in narrow channels to detect when vessels are approaching a passing or overtaking situation in a channel too narrow to safely accomplish it, or when a vessel will be crossing the channel too close to an oncoming vessel in the channel. The location of each end point of up to 20 constricted areas will be specified in the data base. At a preset time interval before a vessel will enter any constricted area the system will verify that the constricted area will be free of opposing traffic of sufficient size to be hazardous. Also, whenever a vessel is about to cross the channel, the movement will be accomplished within a preset amount of time before or after any other vessel in the channel arrives at the crossing location.

Each of the preset times mentioned above will be data base constants accessible to the Watch Supervisor. Also in the data base for each constricted area are specifications of the size combinations of vessels (one of four sizes for each vessel) which constitute a dangerous encounter. The dangerous encounter processing will run at a rate not faster than once every 30 seconds.

Figure 14-6 depicts the Dangerous Encounter process described below.

14.2.6.1 State 1 - Vessel Exempt

See Subsection 14.2.2.1 of the Lane Stray process.

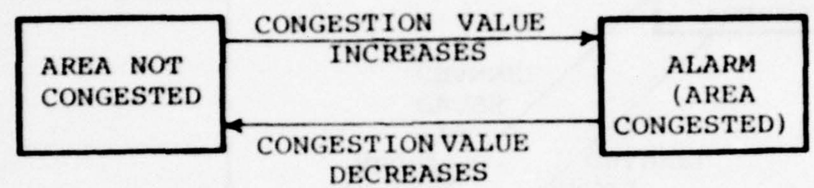


FIGURE 14-5. EXCESSIVE CONGESTION

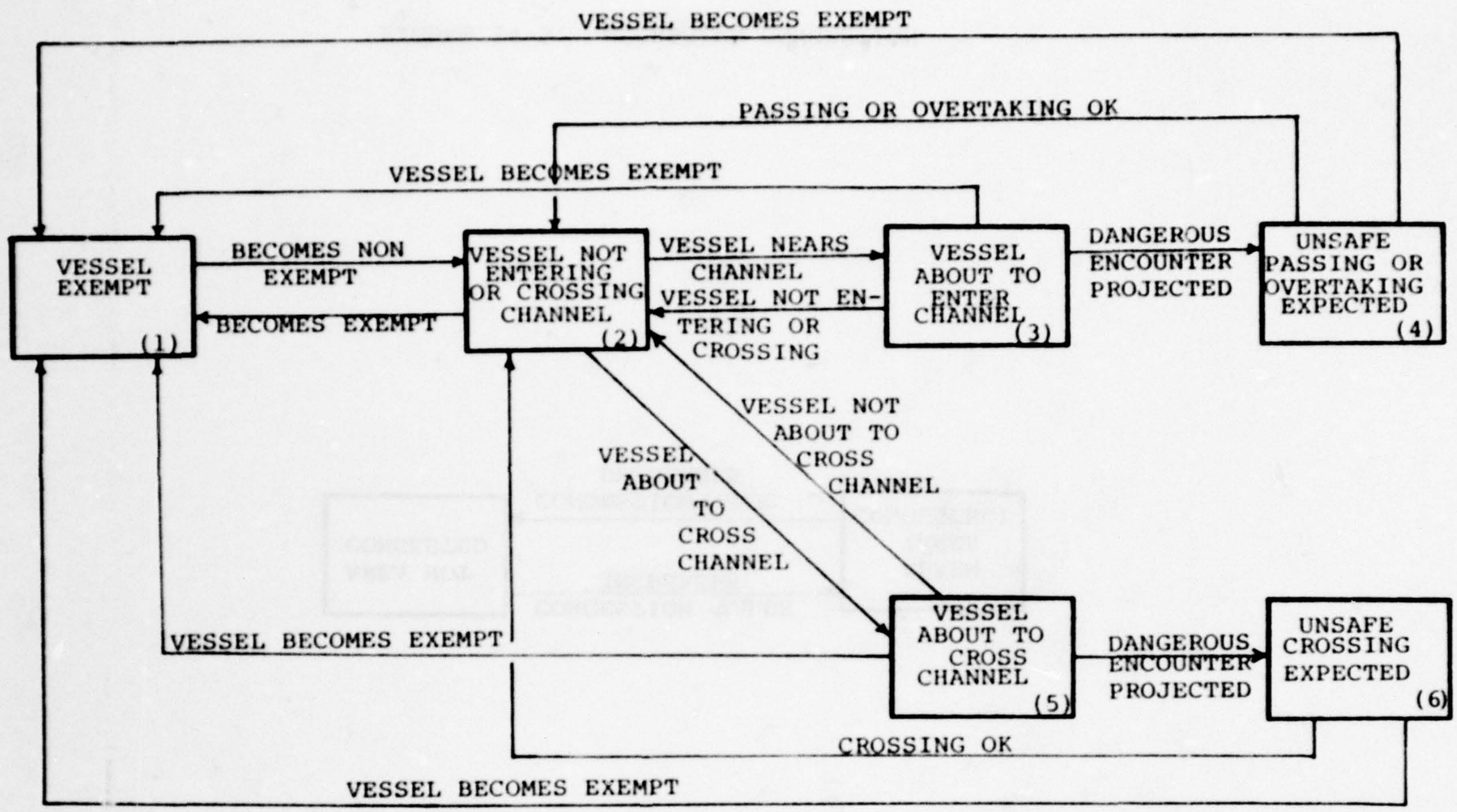


FIGURE 14-6. DANGEROUS ENCOUNTER

14.2.6.2 State 2 - Vessel Not Entering or Crossing Channel
Normally, a vessel will not be about to enter or cross a channel; therefore, a vessel will usually be in State 2. If it is about to enter or cross a channel, it will go to State 3 or State 5.

14.2.6.3 State 3 - Vessel About to Enter Channel
A vessel enters State 3 when it is about to enter a constricted channel area. If a dangerous passing or overtaking can be predicted, the vessel goes to State 4 and an alert is issued; otherwise, the vessel returns to State 2.

14.2.6.4 State 4 - Unsafe Passing or Overtaking Expected
State 4 is entered from State 3 if an unsafe passing or overtaking is predicted. When the potential hazard has been resolved, the vessel returns to State 2. If the vessel becomes exempt, it returns to State 1.

14.2.6.5 State 5 - Vessel About to Cross Channel
A vessel enters State 5 from State 2 if it is about to cross a channel. If a dangerous crossing can be predicted, the vessel enters State 6; otherwise, the vessel returns to State 2. If the vessel becomes exempt, it returns to State 1.

14.2.6.6 State 6 - Unsafe Crossing Expected
If an unsafe crossing is expected, the vessel enters State 6. An alarm is generated by the system when this condition is detected. When the condition has been resolved, the vessel returns to State 2. If the vessel becomes exempt, it returns to State 1.

14.2.7 Anchor Drift
The system will check the present measured position of all identified anchored vessels within the coverage of Level 4 or 5 sensors. An anchor drift alert is issued if a vessel moves outside the specified swing radius from its assigned anchorage location. This check is repeated at a rate not faster than once per minute.

Figure 14-7 depicts the Anchor Drift process described below.

14.2.7.1 State 1 - Vessel Exempt

See Subsection 14.2.2.1 of the Lane Stray Process.

14.2.7.2 State 2 - Vessel Inside Swing Radius

A non-exempt vessel with a reported location within its specified swing radius is in State 2. If the vessel moves outside its swing radius it enters State 3. If it becomes exempt, it returns to State 1.

14.2.7.3 State 3 - Vessel Outside Swing Radius

If the vessel moves outside its swing radius, it enters State 3 from State 2. An alert will be issued when this condition is recognized by the system. If the vessel moves back inside the swing radius, it returns to State 2. If the vessel becomes exempt, it returns to State 1.

14.2.8 <u>Navigational Aid (Navaid) Adrift or Missing</u>

Each specified Navaid within the coverage area of Level 4 or 5 sensors is compared to its normal position. The normal display symbol for a Navaid is replaced with a special symbol when Level 4 or 5 sensors lose track of a specified Navaid (Navaid missing), or if a Navaid in track is outside its specified watch circle (Navaid adrift). Not all Navaids are subject to this processing; only those specified to receive this processing by the Watch Supervisor will be checked.

Processing to detect a Navaid adrift/missing will be repeated at a rate not faster than once every minute.

Figure 14-8 depicts the Navaid Adrift/Missing process described below.

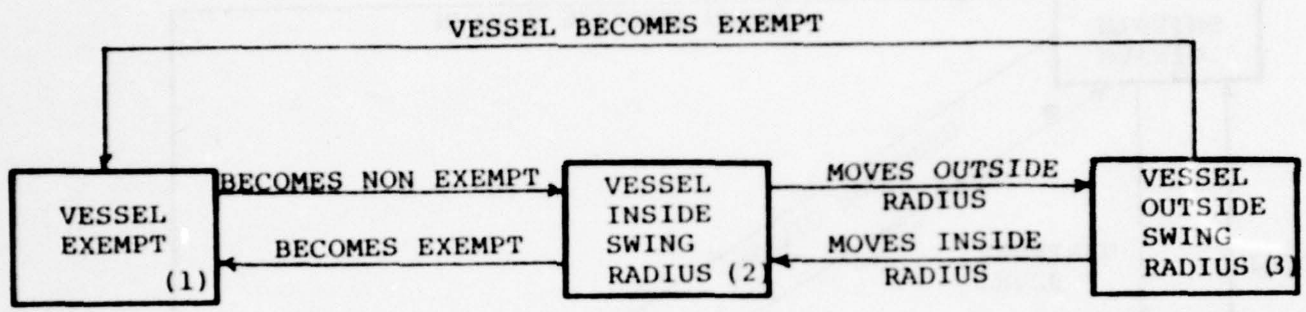


FIGURE 14-7. ANCHOR DRIFT

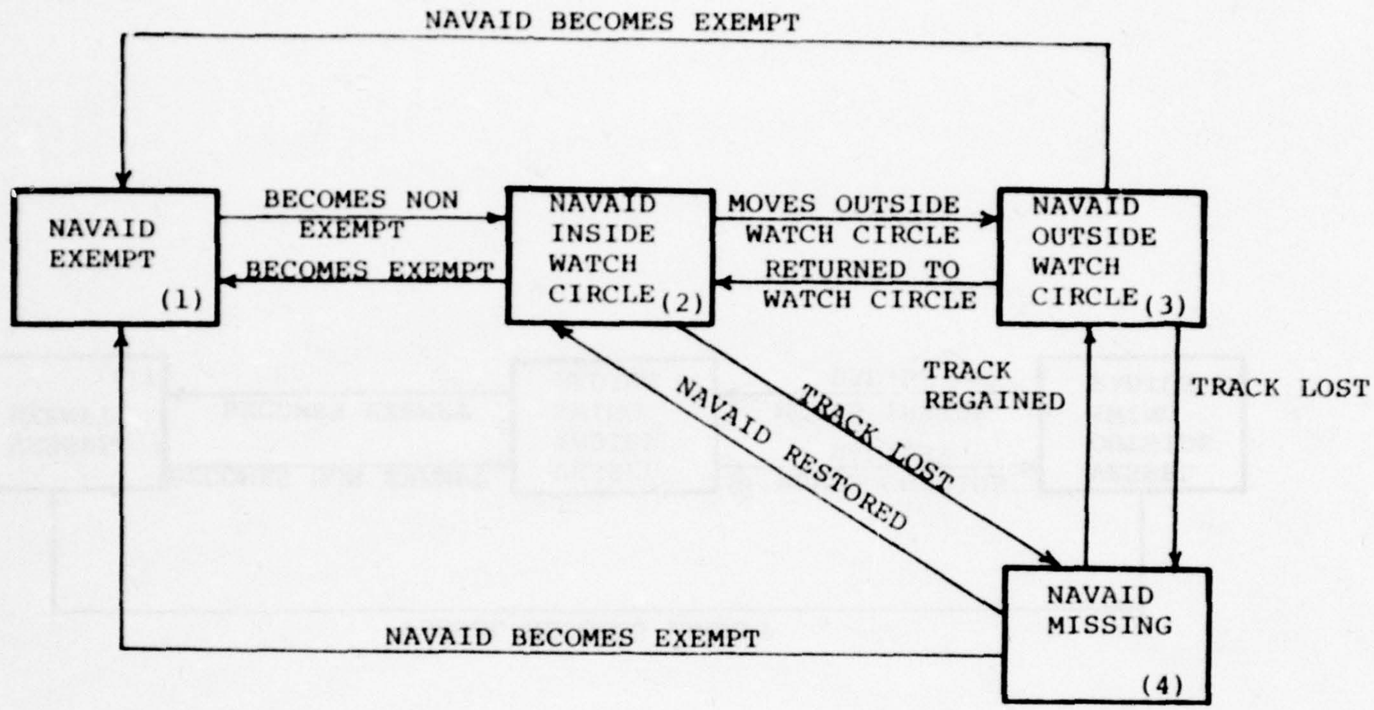


FIGURE 14-8. NAVAID ADRIFT/MISSING

14.2.8.1 State 1 - Navaid Exempt

A Navaid will be exempt unless the Watch Supervisor has specifically designated it for processing. If it becomes non-exempt, it enters State 2. If a Navaid is made exempt, it returns to State 1 from any of the other states.

14.2.8.2 State 2 - Navaid Inside Watch Circle

Non-exempt Navaids which are inside their watch circle will be in State 2. If the Navaid moves outside its watch circle or it is lost from track, it is in State 3 or 4, respectively.

14.2.8.3 State 3 - Navaid Outside Watch Circle

If a Navaid moves outside its watch circle, it enters State 3 from State 2. If the track is lost, it enters State 4. If the track is subsequently restored, but the Navaid remains off-station, State 3 is reentered. If the Navaid is returned to its station, it returns to State 2. If it becomes exempt, it returns to State 1.

14.2.8.4 State 4 - Navaid Missing

State 4 is entered from State 2 or State 3 when the Level 4 or 5 sensors lose track of it. When the track is restored, the Navaid returns to State 2 or State 3 if it is off-station. It returns to State 1 if it becomes exempt.

14.2.9 <u>Excessive Vessel Speed</u>

The system will check the measured speed of vessels in all route segments and cells for which a maximum speed has been specified. If a vessel is proceeding at a speed "x" knots above the limit (where "x" is a data base constant accessible by the Watch Supervisor station), an alert will be issued. This check will be performed at a rate not faster than once every 60 seconds.

Figure 14-9 depicts the Excessive Vessel Speed process described below.

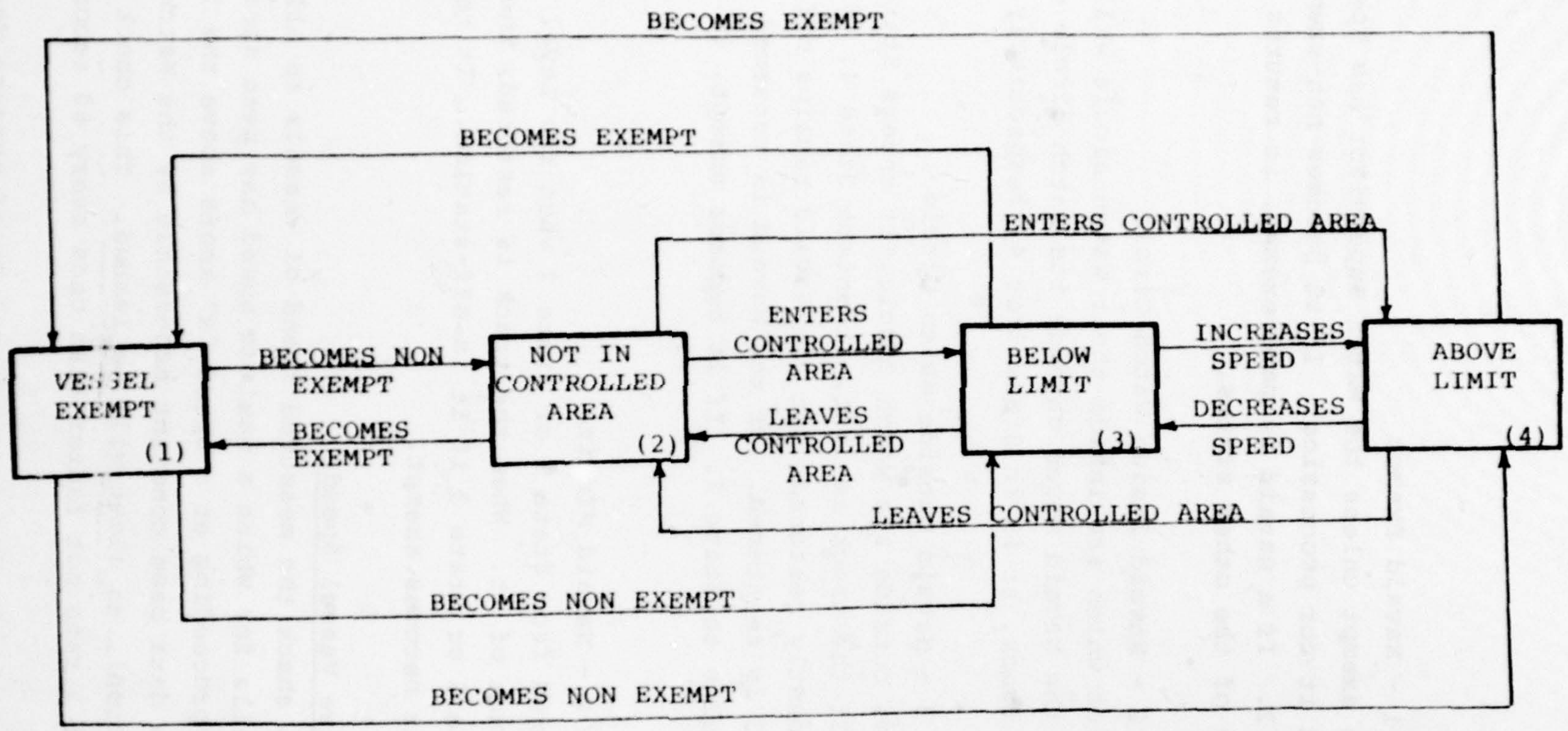


FIGURE 14-9. EXCESSIVE VESSEL SPEED

14.2.9.1 State 1 - Vessel Exempt

A vessel will be exempt if the Watch Supervisor has specified that it is to be exempt. If the exemption is removed, the vessel can enter any of the other states depending on its location and speed. An exemption will return the vessel to State 1 from any other state.

14.2.9.2 State 2 - Not in Controlled Area

When a non-exempt vessel is currently outside a speed controlled route or area, it is in State 2. When a vessel enters a controlled area, it enters State 3 or State 4 depending on its speed. When it leaves a controlled area, the vessel returns to State 2.

14.2.9.3 State 3 - Below Limit

A vessel will be in State 3 when it is in a controlled area and its measured speed is less than the established limit plus the Watch Supervisor specified allowance. If it leaves the controlled area, it returns to State 2. If its speed increases relative to the limit, it enters State 4.

14.2.9.4 State 4 - Above Limit

A vessel in a controlled area travelling in excess of the allowable speed will be in State 4. When the vessel enters State 4 an alert will be issued.

If the vessel leaves the controlled area, it goes to State 2. If its speed drops below the limit, it goes to State 3. If it is exempted, it returns to State 1.

14.3 AUTOMATIC POSITION UPDATE

In a Level 1 or Level 3 area, vessel position information is entered into the system in the form of reports by the watchstander that a particular vessel has passed a certain waypoint at a certain time, proceeding at a certain speed. Between reports the system will automatically update the position of each vessel by dead reckoning not faster than once every minute. The dead reckoning will be based on its intended route, the time at the last waypoint, and the reported speed of advance. When a dead reckoned vessel is moved past a waypoint and no new waypoint report is received by "n" minutes past its expected arrival ("n" predetermined by the Watch Supervisor), the traffic coordinator will be alerted to the overdue vessel; however, the vessel will continue to be dead reckoned ahead until a new report is received or the watchstander terminates the vessel.

In a Level 2 area, the position of vessels is updated by dead reckoning between reports from the sensors at the waypoints in the same manner as described above for Level 1 and Level 3 areas. The only differences are that reports of vessels passing waypoints are accepted by the system automatically and, since many types of automatic point sensors do not have the ability to identify the particular vessel passing the sensor, at times only the presence of a vessel can be determined. In this case, the system compares the dead reckoned position of all vessels in its data base to determine which was the most probable one passing the sensor. When the system is not able to determine its identity to at least 90% probability because of ambiguities, the traffic coordinator will be alerted and may use radio or other means to identify the vessel.

In a Level 4 and 5 area, position update will be directly received from the radar tracker equipment every six seconds. Usually in a Level 4 area, once a vessel is acquired by the tracker and still in track, there is no ambiguity as to the vessel's identification. However, three ambiguous exceptions are possible in a Level 4 area:

. When a vessel has entered a radar shadow then reappears as it leaves the shadow

. When the vessel has gone under a bridge, masking the vessel radar return, then reappears from under the bridge

. When two vessels have gone so close together that their radar images merge and then separate.

In each of these situations as the radar images reappear there is always a question of whether or not the reappearing image is the same vessel (especially where more than one vessel is under the bridge, in the shadow, or separating from the merging).

The system will attempt to resolve these ambiguities by considering the following information:

. Intended route of the vessel(s)

. Approximate size of the radar return(s) compared to the reported length of vessels

. Expected time and place of reappearance of the vessel image as determined by dead reckoning from the last known position, course, and speed.

Where ambiguity cannot be resolved with a high degree of confidence, the traffic coordinator will be alerted to use another means of identification. In a Level 5 area, these ambiguities cannot occur because the active transponders will transmit a vessel identifier.

When a Level 4 or 5 sensor loses track of an identified vessel (except when the vessel is temporarily hidden by shadows, bridges, etc., where the vessel will be temporarily dead reckoned), the symbol of the affected vessel on the map display will freeze at its last known position and will blink to alert the operator to the situation.

The system must be able to recognize the states of the vessels by examining data supplied by the tracking units. The tracker will supply the following information every six seconds:

. Track Number
. Range
. Bearing
. Range Rate
. Bearing Rate
. Track Status Bits
. Second Track Number for Merged Track

The track status bits include:

. First Report Flag
The first report flag indicates to the system that this is a new contact.

. Coast Flag
The coast flag indicates that the radar tracking subsystem is temporarily dead reckoning the vessel it is in a radar shadow.

. Merge Flag

The merge flag indicates that the tracker cannot distinguish between two vessels. If two tracks merge, the merge flag is set and the track number of the second vessel is included.

. Drop Flag

The drop flag is set when the tracker loses a vessel from track.

. Overlap Flag

The overlap flag is set when a vessel is within the range of more than one radar.

. Error Flag

The error flag is set when the tracker detects an internal error.

. Size Code

The size code identifies four size ranges for the radar return.

The requirements for Levels 1, 2, 3, and 5 are straightforward; therefore, no state diagrams have been included for these cases. A state diagram has been included (see Figure 14-10) for Level 4, Automatic Position Update. This diagram shows the states of a vessel with respect to radar tracking units.

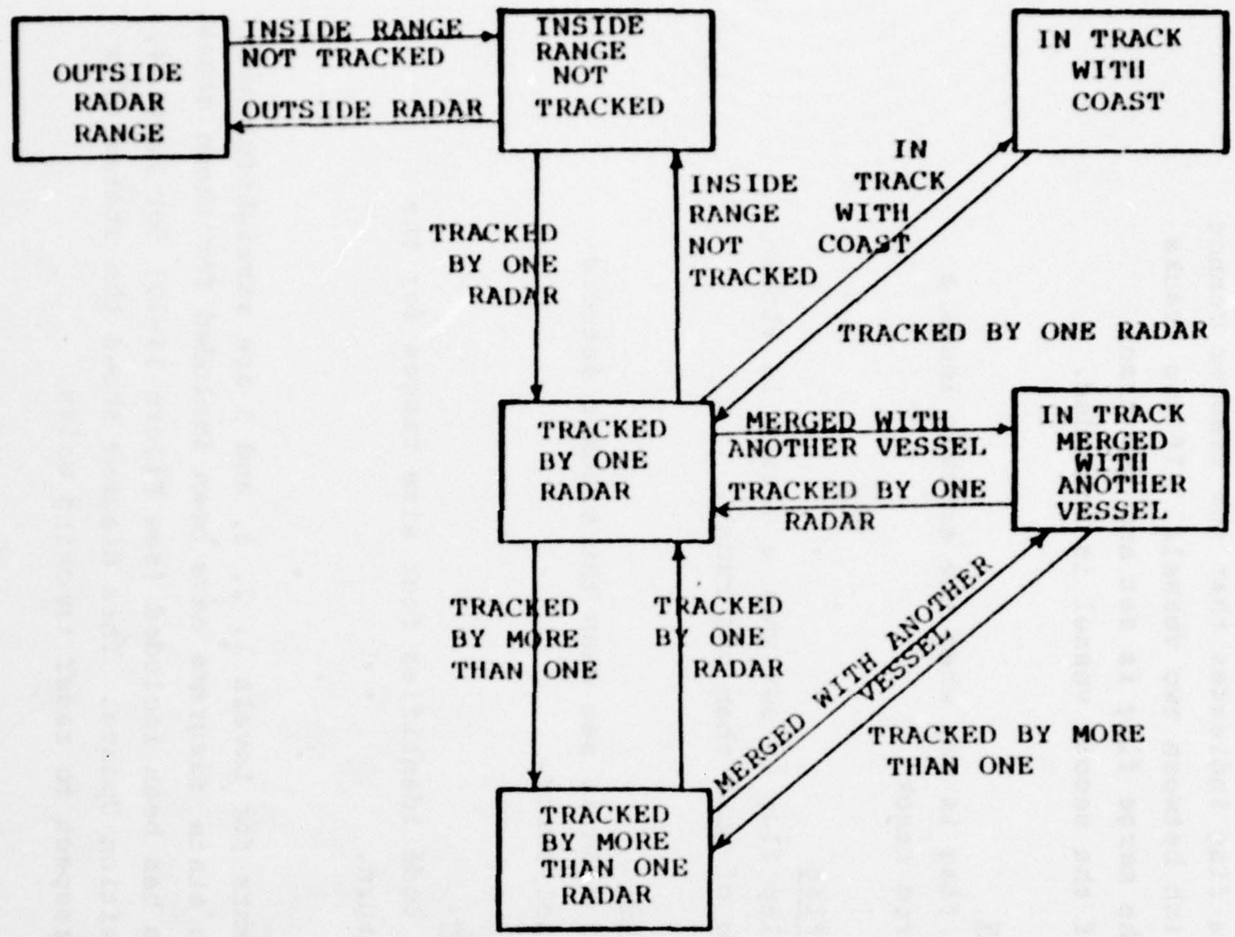


FIGURE 14-10. LEVEL 4 AUTOMATIC POSITION UPDATE